DRAFT

TECHNICAL MANUAL

FLOOD HAZARD AREA CONTROL ACT RULES

NEW JERSEY

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF LAND USE REGULATION

DECEMBER 2008

DRAFT

TECHNICAL MANUAL

FLOOD HAZARD AREA CONTROL ACT RULES

N.J.A.C. 7:13

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State of New Jersey

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Section 1

Introduction

1.1 Introduction and Background

On November 5, 2007, the Department of Environmental Protection adopted new Flood Hazard Area Control Act rules at N.J.A.C. 7:13 to replace the previous set of rules that had been in effect since 1995.

The Flood Hazard Area Control act rules implement the New Jersey Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and satisfy the State's statutory directive to "adopt land use regulations for the flood hazard area, to control stream encroachments, to coordinate effectively the development, dissemination, and use of information on floods and flood damages that may be available, to authorize the delegation of certain administrative and enforcement functions to county governing bodies and to integrate the flood control activities of the municipal, county, State and Federal Governments" (N.J.S.A. 58:16A-50b).

Unless properly controlled, development within flood hazard areas can exacerbate the intensity and frequency of flooding by reducing flood storage, increasing stormwater runoff and obstructing the movement of floodwaters. In addition, structures that are improperly built in flood hazard areas are subject to flood damage and threaten the health, safety and welfare of those who use them. Furthermore, healthy vegetation adjacent to surface waters is essential for maintaining bank stability and water quality. The indiscriminate disturbance of such vegetation can destabilize channels, leading to increased erosion and sedimentation that exacerbates the intensity and frequency of flooding. The loss of vegetation adjacent to surface waters also reduces filtration of stormwater runoff and thus degrades the quality of these waters. The Flood Hazard Area Control Act rules therefore incorporate stringent standards for development in flood hazard areas and adjacent to surface waters in order to mitigate the adverse impacts to flooding and the environment that can be caused by such development. On November 5, 2007, the Department also adopted related amendments to the Coastal Permit Program rules, N.J.A.C. 7:7, and to the Coastal Zone Management rules, N.J.A.C. 7:7E, in order to ensure better consistency with N.J.A.C. 7:13 as regards development in flood hazard areas and preservation of vegetation and habitat along surface waters.

The Flood Hazard Area Control Act rules incorporate a large amount of detail and description regarding the substantive standards that must be met to undertake regulated activities for better consistency among the Department's Land Use rules as well as to facilitate understanding and compliance among the regulated community. Furthermore, permits issued under the previous rules were commonly referred to as "stream encroachment permits," which implies the existence of both a stream and an encroachment into a stream, neither of which are necessarily aspects of an activity regulated under N.J.A.C. 7:13. To better reflect that this chapter implements the statutory authority of the Flood Hazard Area Control Act, approvals issued under this chapter are now referred to as flood hazard area approvals.

There are three steps in determining whether a proposed activity requires an approval under the Flood Hazard Area Control Act rules:

1. Determine whether the surface water in question is regulated by these rules (under N.J.A.C. 7:13-2.2).
2. If the surface water is regulated, determine whether the proposed activity lies within the flood hazard area or riparian zone of the regulated water (under N.J.A.C. 7:13-2.3).
3. If the proposed activity lies within a regulated area, determine whether the proposed activity is a regulated activity (under N.J.A.C. 7:13-2.4).

Before undertaking a "regulated activity" in a "regulated area" along a "regulated water," you must first obtain a flood hazard area approval. There are various types of approvals depending on the type of activity being proposed. These approvals are introduced below and are more fully discussed in subsequent sections of this manual.

1.2 Regulated Waters

A surface water that is subject to the Flood Hazard Area Control Act rules is called a "regulated water." Under N.J.A.C. 7:13-2.2, all surface waters in the State of New Jersey are regulated with three exceptions:

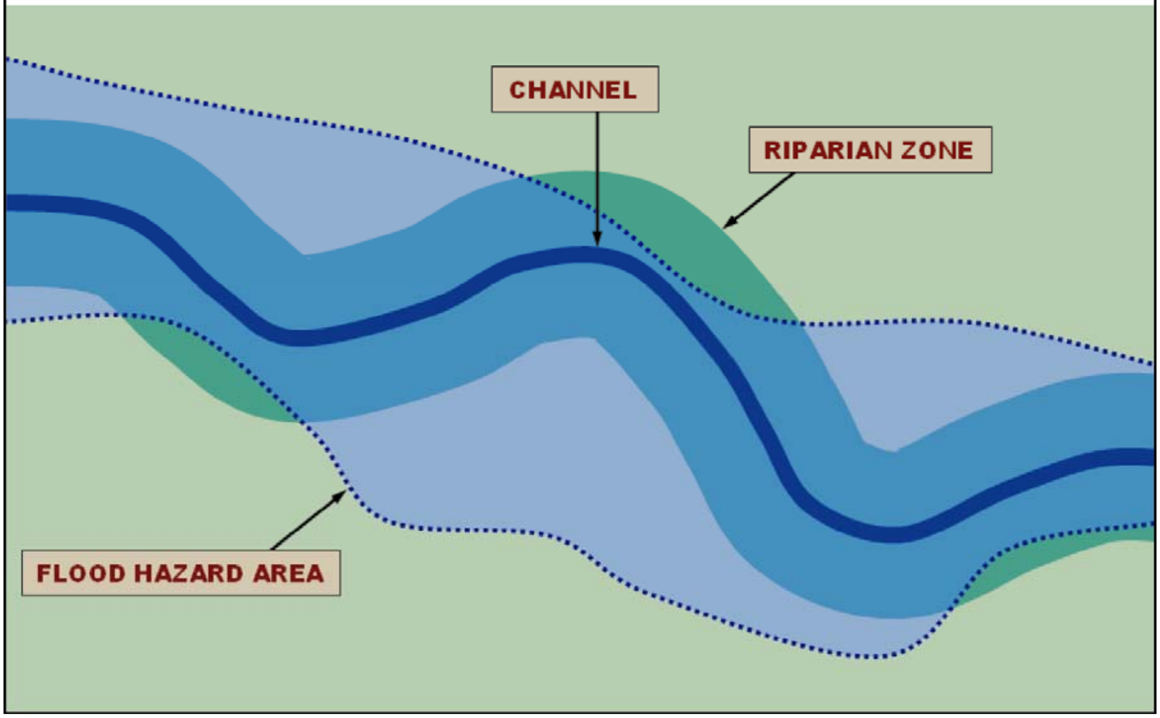
1. Any manmade canal;
2. In accordance with N.J.S.A. 58:16A-60, any coastal wetland regulated under the Wetlands Act of 1970 (N.J.S.A. 13:9A-1 et seq.); and
3. Any segment of water that has a drainage area of less than 50 acres, provided one or more of the following applies:
   i. The water has no discernible channel;
   ii. The water is confined within a lawfully existing, manmade conveyance structure or drainage feature, such as a pipe, culvert, ditch, channel or basin (not including any water that historically possessed a naturally-occurring, discernible channel, which has been piped, culverted, ditched or similarly modified); and/or
   iii. The water is not connected to a regulated water by a channel or pipe, such as an isolated pond or depression that has no outlet.

If a surface water does not meet one of the criteria listed above, it is considered a "regulated water" for the purposes of the Flood Hazard Area Control Act rules.

1.3 Regulated Areas

The Flood Hazard Area Control Act rules have authority over development activities within two distinct and overlapping areas of jurisdiction: the flood hazard area and the riparian zone.

Figure 1.1



The flood hazard area is the area that is inundated by the flood hazard area design flood, which is the flood regulated by the State under these rules. It is equal to the 100-year flood plus a factor of safety in non-tidal areas (see N.J.A.C. 7:13-3 as well as section 2 of this manual). The riparian zone is 50, 150 or 300-ft along both sides of a regulated water (see N.J.A.C. 7:13-4 as well as section 4 of this manual). Some regulated waters have only a flood hazard area, some have only a riparian zone, and most have both.

1.3.1 Flood Hazard Area

Pursuant to N.J.A.C. 7:13-2.3(a)1, a flood hazard area exists along every regulated water that has a drainage area of 50 acres or more. If a regulated water has a drainage area of less than 50 acres, the water does not have a flood hazard area that is regulated under the Flood Hazard Area Control Act rules. The flood hazard area is comprised of a flood fringe and a floodway, except for the Atlantic Ocean and other non-linear tidal waters such as bays and inlets, which do not have a floodway. Therefore, the entire flood hazard area along these tidal waters is considered to be a flood fringe for the purposes of this chapter. The methods for determining the limits of the flood fringe and floodway are described at N.J.A.C. 7:13-3.

N.J.A.C. 7:13-3 provides six methods for determining the extent of the flood hazard area and floodway. More than 2,500 miles of regulated waters have been delineated by the Department. These waters are listed in Appendix 2 of the Flood Hazard Area Control Act rules. If there is a Department delineation for a regulated water, the limits of the flood hazard area on the site must be determined using these maps (in accordance with Method 1, which is described at N.J.A.C. 7:13-3.3). In absence of a Department delineation, an applicant may choose among the other five methods under certain conditions. The flood hazard area and/or floodway can be determined based on information provided by FEMA in certain cases under Methods 2, 3 or 4 (described at N.J.A.C. 7:13-3.4) or, if the applicant prefers, through calculation under Method 6 (described at N.J.A.C. 7:13-3.6). If neither a Department delineation nor the necessary FEMA information is available, an applicant may also choose to determine the flood hazard area by approximation under Method 5 (described at N.J.A.C. 7:13-3.5).

A property that lies in a flood hazard area is periodically inundated by floodwaters. Consequently, a certain volume of floodwater will occupy that property during a flood. If a significant volume of floodwater is prevented from occupying a site, the excess floodwater will instead occupy neighboring and downstream properties, thus worsening flood conditions on those sites. Flood storage on a site can be reduced by erecting a structure, which prevents floodwaters from entering a portion of the site, or by raising the ground through the placement of fill material. Since this can adversely impact other properties, the Flood Hazard Area Control Act rules include various restrictions on the volume of floodwater that can be displaced by development.

In order to help protect the residents of New Jersey from the hazards of increased flooding caused by development, the Flood Hazard Area Control Act rules include restrictions on how much fill can be placed within a flood fringe. In non-tidal areas, development is not allowed to cause any net displacement of flood storage (referred to as zero-percent net fill). Development is allowed to displace up to 20 percent of the flood storage on a given site, provided an equal volume of flood storage compensation is created offsite to meet the zero-percent requirement. However, all flood storage compensation must be made in the same flood hazard area and watershed as the proposed fill, and cannot be separated from the proposed fill by a water control structure such as a road or dam. The rules also require that flood storage calculations be performed for two distinct areas: the area between the flood hazard area design flood and the 10-year flood, and the area between the 10-year flood and the ground. The 20-percent onsite and the zero-percent overall fill limitations must be met for both of these areas. See N.J.A.C. 7:13-10.4 for details.

1.3.2 Riparian Zone

Pursuant to N.J.A.C. 7:13-2.3(a)2, a riparian zone exists along every regulated water, except there is no riparian zone along the Atlantic Ocean nor along any manmade lagoon, stormwater management basin, or oceanfront barrier island, spit or peninsula. The regulated water itself is also part of the riparian zone. The methods for determining the limits of the riparian zone are described at N.J.A.C. 7:13-4.1.

Research has shown that vegetated areas adjacent to a watercourse provide a variety of significant functions and values. For example, the United States Army Corps of Engineers has stated that vegetated buffers along waters serve to:

1. Reduce adverse effects to water quality by removing nutrients and pollutants from surface runoff;
2. Reduce concentrations of nutrients and pollutants in subsurface water that flows into streams and other open waters;
3. Moderate storm flows to streams, which reduces downstream flooding and degradation of aquatic habitat;
4. Stabilize soil (through plant roots), which reduces erosion in the vicinity of the open water body;
5. Provide shade to the water body, which moderates water temperature changes and provides a more stable aquatic habitat for fish and other aquatic organisms;
6. Provide detritus, which is a food source for many aquatic organisms;
7. Provide large woody debris from riparian zones, which furnishes cover and habitat for aquatic organisms and may cause the formation of pools in the stream channel;
8. Provide habitat to a wide variety of aquatic and terrestrial species;
9. Trap sediments, thereby reducing degradation of the substrate that provides habitat for fish and other aquatic organisms (for example, some fish species depend upon gravel stream beds for spawning habitats); and
10. Provide corridors for movement and dispersal of many species of wildlife. In addition, vegetated buffers next to streams provide flood storage capacity and groundwater recharge functions.

(Source: Federal Register Volume 64 No. 139 Page 39274, July 21, 1999)

Given the many important ecological functions that a healthy riparian zone provides, adequately preserving such areas is essential to protecting New Jersey's natural resources and water supply. The width of the riparian zone depends on the resources in the surface water being protected. The width of the riparian zone is:

- 300 feet along both sides of Category One waters (and all upstream tributaries within the same HUC-14 watershed);
- 150 feet along: trout production waters and all upstream tributaries; trout maintenance waters (and tributaries within one mile upstream); waters flowing through an area that contains documented habitat for a threatened or endangered species of plant or animal, which is critically dependent on the regulated water for survival (and tributaries within one mile upstream); and waters that flow through an area that contains acid producing soils; and
- 50 feet along all other waters.

The riparian zone is described in detail at N.J.A.C. 7:13-4.1 and the criteria for construction within a riparian zone is contained at N.J.A.C. 7:13-10.2.

1.4 Regulated Activities

Pursuant to N.J.A.C. 7:13-2.4, any action that includes or results in one or more of the following constitutes a regulated activity under the Flood Hazard Area Control Act rules if undertaken in a regulated area, as described at N.J.A.C. 7:13-2.3:

1. The alteration of topography through excavation, grading and/or placement of fill;
2. The clearing, cutting and/or removal of vegetation in a riparian zone;
3. The creation of impervious surface;
4. The storage of unsecured material;
5. The construction, reconstruction and/or enlargement of a structure; and
6. The conversion of a building into a private residence or a public building.

1.5 Permit Requirement

Before undertaking a “regulated activity” in a “regulated area” along a “regulated water,” one of the following permits must first be obtained:

1. A permit-by-rule, pursuant to N.J.A.C. 7:13-7;
2. An authorization under a general permit, pursuant to N.J.A.C. 7:13-8;
3. An individual permit, pursuant to N.J.A.C. 7:13-9, 10 and 11;
4. An emergency permit, pursuant to N.J.A.C. 7:13-12; or
5. A CAFRA or waterfront development permit, pursuant to N.J.A.C. 7:7 and N.J.A.C. 7:7E, provided:
   i. The CAFRA or waterfront development permit was declared by the

Department as complete for final review on or after November 5, 2007; and

ii. If activities are proposed in a fluvial flood hazard area, the applicant meets one of the four conditions at N.J.A.C. 7:13-9.6(a) regarding the need for a verification of the flood hazard area and/or floodway onsite.

1.5.1 Permits-by-Rule

The Flood Hazard Area Control Act rules include permits-by-rule for 46 regulated activities as described at N.J.A.C. 7:13-7. A permit-by-rule is an authorization to undertake a specific regulated activity without the need to obtain prior written approval from the Department provided all conditions of the permit-by-rule are satisfied. Although the activities permitted-by-rule meet the definition of a regulated activity under N.J.A.C. 7:13-2.4, the Department has determined that each of these activities will have a *de minimis* impact on flooding and the environment if undertaken as prescribed by each permit-by-rule. The eight permits-by-rule at N.J.A.C. 7:13-7.2(a) require an applicant to notify the Department in writing or electronically 14 days prior to construction.

1.5.2 General Permits

The Flood Hazard Area Control Act rules include general permits for 16 activities in order to facilitate undertaking various activities that have been identified as having minimal impacts. These general permits cover certain stream cleaning, scour protection and stormwater facility maintenance activities by public entities, various agricultural activities under Natural Resources Conservation Service (NRCS) oversight, relocation and reconstruction of damaged buildings, and certain activities along small streams and in tidal flood hazard areas.

General permits are for specific regulated activities and involve a simplified application to the Department as well as a special certification from an engineer. No public notice is required for an activity undertaken pursuant to a general permit and an application fee of $500.00 is required except for general permit 1 (for activities under the Stream Cleaning Act, N.J.S.A. 58:16A-67) and general permit 6 (to reconstruct and elevate a private residence destroyed by flood, fire or natural disaster).

1.5.3 Individual Permits

Any regulated activity in a regulated area, if not covered under a permit-by-rule or general permit, will require an individual permit (unless a coastal permit is obtained for the activity as described below).

The design and construction standards for any project that requires an individual permit under the Flood Hazard Area Control Act rules are contained in Subchapter

10: Individual Permit Requirements within Various Regulated Areas, and Subchapter 11: Individual Permit Requirements for Various Regulated Activities.

A project can be located within a particular portion of the regulated area (such as the channel, riparian zone, floodway or flood fringe) or within an area that contains certain natural resources or special features (such as fishery resources, threatened or endangered species, or areas that contain acid-producing soils) provided necessary standards are satisfied. The requirements of Subchapter 10 are therefore called "area-specific" since the particular requirements depend upon the location of the project. Similarly, the requirements in Subchapter 11 are described as being "activity-specific" because they apply to specific activities, such as the construction of a building or a roadway, rather than where the activity is located. Note that these standards are cumulative: a project may be located in several different regulated areas (floodway, flood fringe, riparian zone, etc.) and involved a number of different project elements (roadway, building, utility crossing, etc.) Each relevant section of Subchapters 10 and 11 should therefore be consulted in order to determine whether the overall project complies with the design and construction requirements of each section. Application procedures and other provisions related to obtaining an individual permit are described under Subchapter 9.

The Department recognizes that situations exist when strict compliance with the requirements of this chapter would create an undue hardship on an applicant. The standards of the Flood Hazard Area Control Act rules are designed to capture nearly all situations that could come before the Department. However, for those cases that are not specifically addressed by the rule text, the rules include a section for “hardship exceptions” under N.J.A.C. 7:13-9.8 to allow for any unanticipated, special and/or unique situations that could arise which, if not permitted, would cause an exceptional or undue hardship on an applicant.

1.5.4 Emergency Permits

As set forth at N.J.A.C. 7:13-12.1, an emergency permit is an authorization to undertake a regulated activity that the Department issues when conditions warrant immediate action to protect the environment and/or public health, safety and welfare. The Department will approve an emergency permit only if the following requirements are satisfied:

1. Severe environmental degradation will occur if an emergency permit is not issued and/or there is an immediate and extraordinary risk to property or the public health, safety and welfare; and
2. There is a high probability that the environmental degradation or impact to property or the public health, safety and welfare will occur before a flood hazard area individual permit or general permit authorization could be obtained under the otherwise applicable requirements of this chapter.

A complete application for an individual permit or a general permit authorization must be submitted to the Department (for the approval of the emergency activities) within 90 calendar days of the Department's verbal approval of the emergency permit. The necessary procedures to be followed after an emergency permit is issued are set forth at N.J.A.C. 7:13-12.2.

1.5.5 Coastal Permits

All construction standards under the Flood Hazard Area Control Act rules have been incorporated by reference into the Coastal Zone Management rules. Therefore, when reviewing a CAFRA or Waterfront Development permit application, the Department will ascertain whether the coastal project meets the requirements of the Flood Hazard Area Control Act rules, for any work proposed within a flood hazard area or riparian zone. As such, obtaining a coastal permit will fully satisfy the design requirements of the Flood Hazard Area Control Act rules. Consequently, there is no need to obtain a separate flood hazard area approval for an activity that has received a CAFRA or Waterfront Development permit.

Note that, in some cases, a large project can lie partially within CAFRA or Waterfront Development jurisdiction and partially outside such jurisdiction. Obtaining a CAFRA or Waterfront Development permit therefore covers the portion of the project that lies within coastal jurisdiction. Any portion of such a project that lies outside coastal jurisdiction, but within the flood hazard area or riparian zone, would therefore need a separate flood hazard area approval.

1.6 Verifications

The Flood Hazard Area Control Act rules include a process by which an applicant may request the Department to verify the limit of the flood hazard area, floodway and/or riparian zone on a site without first obtaining a permit. This is similar to the process for obtaining a letter of interpretation under the Department's Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A. By adopting this process, a person can obtain the Department's confirmation of the limits of jurisdiction on a property under N.J.A.C. 7:13 prior to designing a project. Furthermore, a verification of the flood hazard area and floodway limits must be known in many cases before the Department can issue an individual permit. See N.J.A.C. 7:13-9.6 for a description of the situations when a verification is needed.

1.7 Other approvals

In addition to the approvals listed above, a verification, general permit authorization or individual permit can be revised under the procedures listed under N.J.A.C. 7:13-13.1, 13.2 and 13.3, respectively, and can be transferred to another person (such as a new property owner) via the procedure set forth at N.J.A.C. 7:13-14.1.

1.8 Purpose of this Manual

The Flood Hazard Area Control Act rules are designed to be both highly descriptive and prescriptive. All of the design and construction standards related to undertaking a regulated activity in a flood hazard area or riparian zone are contained within the various sections of the rules. The purpose of this manual is to assist applicants in obtaining any approvals that may be necessary for an activity under the jurisdiction of this chapter. The material presented here is intended to explain and supplement the standards of the Flood Hazard Area Control Act rules and is in no way intended to replace or supersede these standards. Should material be presented in this manual that is found to be in conflict with a requirement of the Flood Hazard Area Control Act rules, the rules shall govern.

Given the detailed nature of the Flood Hazard Area Control Act rules, it is the Department's belief that most questions regarding project design and application procedures can be answered by reading the appropriate sections of the rules. Further material designed to assist prospective applicants is provided on the Division of Land Use Regulation's website listed below. However, should an applicant be unable to find sufficient answers from reading the rules or from the Division's website, direct assistance can be obtained from Division staff as follows:

Postal address:

State of New Jersey Department of Environmental Protection
Division of Land Use Regulation
P.O. Box 439
Trenton, New Jersey 08625-0439

Street address (for meetings and hand delivery of material):

State of New Jersey Department of Environmental Protection
Division of Land Use Regulation
501 East State Street
Station Plaza 5, 2nd Floor
Trenton, New Jersey 08609-1101

Telephone: (609) 777-0454
Fax: (609) 777-3656 or (609) 292-8115
Website: www.nj.gov/dep/landuse

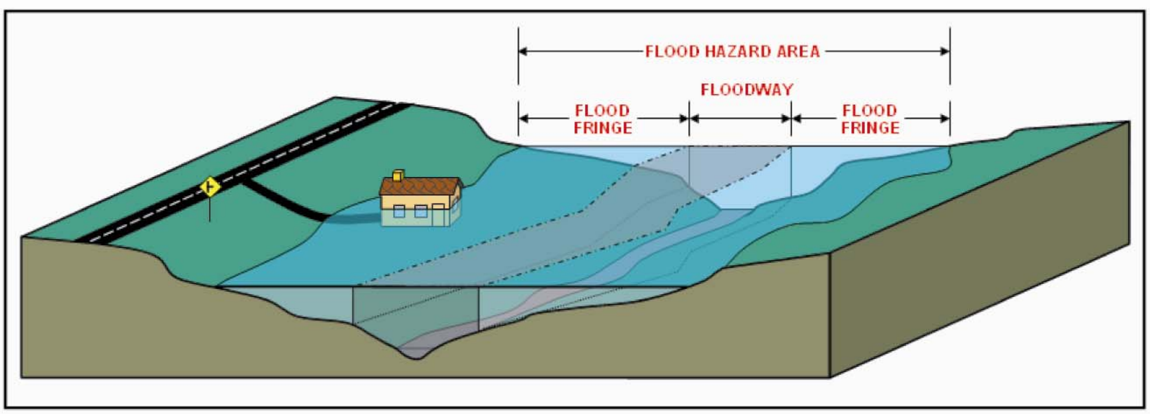
Section 2

Flood Hazard Area

2.1 Introduction

The flood hazard area is the land, and the space above that land, which lies below the flood hazard area design flood elevation. Structures, fill and vegetation that are situated on land that lies below the flood hazard area design flood elevation are described as being "in" or "within" the flood hazard area. The inner portion of the flood hazard area is called the floodway and the outer portion of the flood hazard area is called the flood fringe as illustrated in Figure 2.1 below.

Figure 2.1



There are two types of flood hazard areas:

- Tidal flood hazard area, in which the flood hazard area design flood elevation is governed by tidal flooding from the Atlantic Ocean. Flooding in a tidal flood hazard area may be contributed to or influenced by stormwater runoff from inland areas, but the depth of flooding generated by the tidal rise and fall of the Atlantic Ocean is greater than flooding from any fluvial sources; and

- Fluvial flood hazard area, in which the flood hazard area design flood elevation is governed by stormwater runoff. Flooding in a fluvial flood hazard area may be contributed to or influenced by elevated water levels generated by the tidal rise and fall of the Atlantic Ocean, but the depth of flooding generated by stormwater runoff is greater than flooding from the Atlantic Ocean.

The flood hazard area design flood elevation is the peak elevation that floodwaters will reach on a given site during the flood hazard area design flood, which is the flood that is regulated by the Flood Hazard Area Control Act rules. The flood hazard area design flood is based on the 100-year flood, plus a certain factor of safety in non-tidal areas as discussed below. This factor of safety is necessary to ensure that the public is adequately protected from the impacts of flooding, which may increase over time in non-tidal areas due to development, climatic changes and other factors.

Since development along tidal waters cannot cause the flood elevation of the ocean to rise, a factor of safety is not necessary in tidally-flooded areas. It should also be noted that the 100-year flood is not a flood that will occur once every 100 years as the name implies, but is actually a flood that has a one-percent probability of occurring in any one-year period at a given location. A 100-year flood could therefore occur along a particular stream or river several times in succession and then not occur again for hundreds of years.

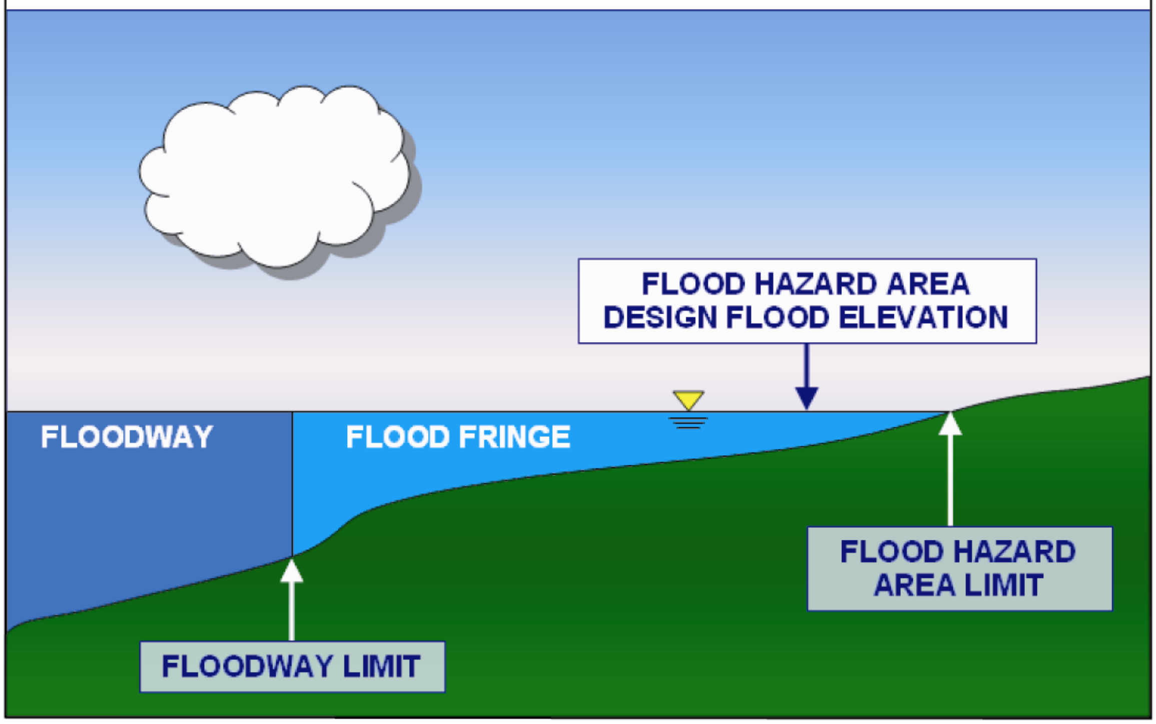
Knowing the flood hazard area design flood elevation and floodway limits on a site are, in many cases, necessary for an applicant to be able to demonstrate to the Department that a proposed activity complies with the requirements of the Flood Hazard Area Control Act rules. Many of the standards in these rules are designed to ensure that buildings and roads will not be flooded or obstruct flood flows, and that flood storage is not being excessively displaced by a given activity. Demonstrating compliance with these and other standards in the rules therefore requires a knowledge of the depth of flooding at a given site and the location of the floodway. An applicant cannot prove, for example, that the lowest habitable floor of a proposed new building is situated above the design flood elevation if that elevation is unknown at that location.

In most cases, therefore, the flood hazard area limit and floodway limit on a site must be determined by the applicant and verified by the Department in order for the Department to be able to approve a flood hazard area permit application for activities on that site. N.J.A.C. 7:13-9.6 sets forth the cases where the Department needs a verification of the flood hazard area and/or floodway limits on a site in order to approve an individual permit. Similarly, a verification is required under certain circumstances to obtain general permits 5, 6 and 7 at N.J.A.C. 7:13-8.7, 8.8 and 8.9, respectively.

2.2 Establishing the Flood Hazard Area Limits

As with all delineation methods under the Flood Hazard Area Control Act rules, the flood hazard area limit is determined by the flood hazard area design flood elevation. Land lying below the flood hazard area design flood elevation lies within the flood hazard area; land that lies above the flood hazard area design flood elevation lies outside the flood hazard area. Both State and FEMA flood mapping show an approximate limit of where the design flood would inundate throughout a given area. However, the actual flood hazard area limit is determined by the ground elevations on that site. Therefore, even if the Department mapping shows an area to lie within (or outside of) the flood hazard area, the actual extent of flooding on a site should be determined based on the ground elevation as compared with the flood hazard area design flood elevation. This is illustrated in Figure 2.2 below.

Figure 2.2



Once the flood hazard area design flood elevation is determined on a site, the flood hazard area can be determined by drawing a line around the portion of the site that would be covered by water when the flood rises to that elevation. Of course an area that has been illegally filled in (and therefore illegally raised above the flood hazard area design flood elevation) still remains regulated.

N.J.A.C. 7:13-3 presents six methods whereby the flood hazard area design flood elevation can be determined along a regulated water, depending on available mapping resources and other information. Each method has certain inherent restrictions on its use depending on a number of factors. Therefore, while six different methods for determining the flood hazard area are provided, fewer than six methods will typically be available for a given water, site or project, and in some cases only one method may be available to an applicant.

A flowchart is provided at the end of N.J.A.C. 7:13-3.2, which illustrates the means of determining the flood hazard area and floodway along a regulated water under various scenarios. Selection of the appropriate method depends on several factors, including some that are set forth in the rules. For example, certain methods rely on State and Federal flood mapping, so these methods cannot be used in areas where such mapping has not been made available. Other factors may not be set forth in the rules but will influence an applicant's choice of method. While all of the methods will provide information on the location of regulated areas on a site, not all methods will provide the type of information or the level of detail necessary for issuance of a permit for certain activities on that site. Therefore, if an applicant has a particular project in mind, the permitting requirements for that project may govern the delineation method the applicant selects.

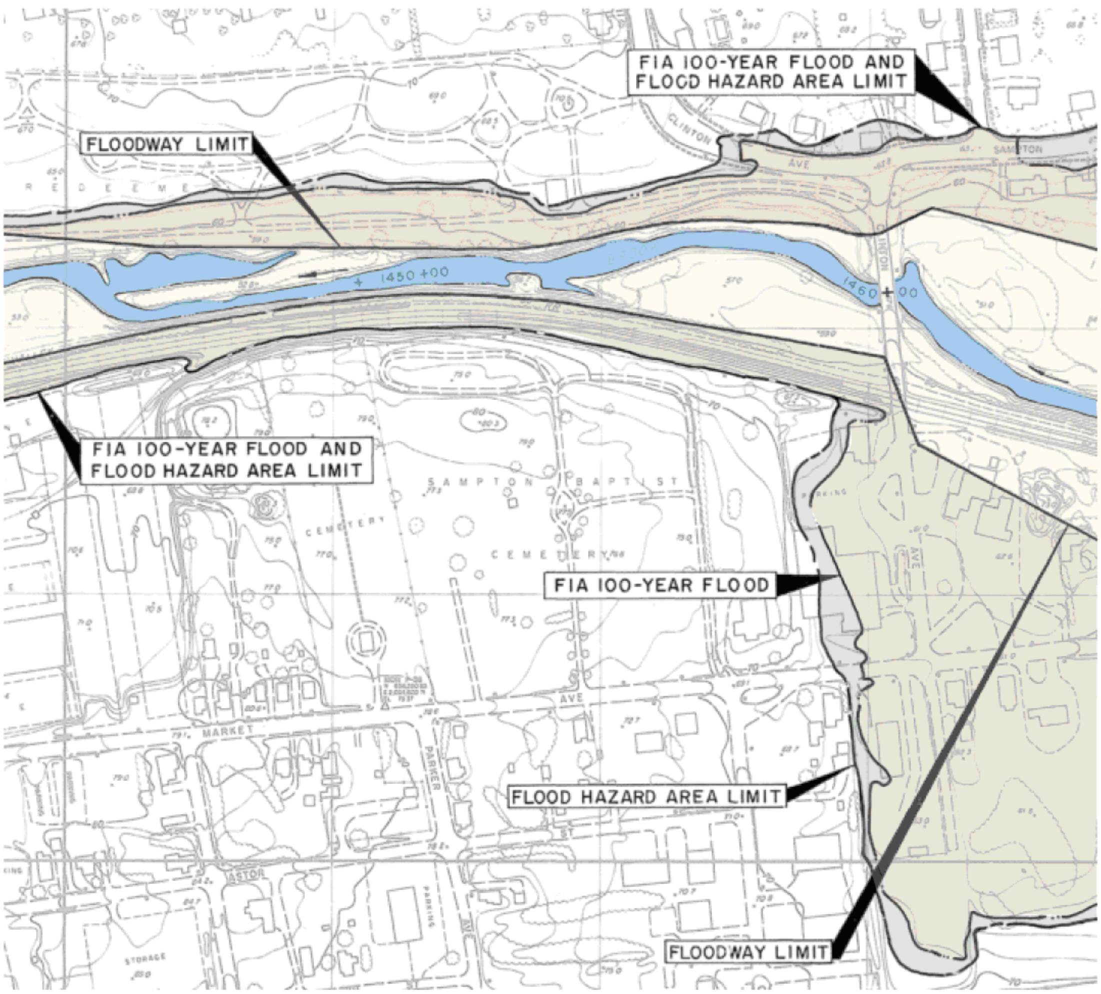
For example, to obtain an individual permit for a bridge under N.J.A.C. 7:13-11.7, an applicant needs to demonstrate that the bridge will not increase offsite flooding above certain acceptable thresholds. This requires not only an accurate delineation of the existing flood hazard area design flood elevation and floodway limits, but also an accurate projection of flood conditions if the proposed bridge is approved and constructed. Therefore, while the rules may not specifically require the use of a particular delineation method, the applicant must submit calculations to demonstrate that various standards are met. This therefore limits the applicant to Method 1 (if State flood mapping is available), Method 4 (if FEMA mapping is available) or Method 6 (if neither State nor FEMA mapping is available) because only these three methods provide the hydraulic data needed to project future flood conditions. By contrast, an applicant constructing one single family home on a site where there is no State or FEMA mapping may choose Method 5 (approximation method) because it is easier and less expensive than using Method 6 and will still provide sufficient accuracy to ensure that the house is either safely elevated or located outside of any flood hazard area.

Another factor that may affect an applicant's choice of a delineation method is whether the standards that will apply to a planned project require the applicant to show where the floodway is located. For example, an applicant may propose to construct a house very close to a stream channel such that the Department cannot determine by inspection that the house is located outside the stream's floodway. In other words, even where floodway limits are unknown, it may be possible to discern that a given project is located so far away from and/or high above the channel that it cannot possibly be located within a floodway. Since the construction of a new house in a floodway is prohibited in most cases under N.J.A.C. 7:13-11.5, the applicant may need to choose a delineation method that provides a floodway limit in order to demonstrate the house is not situated within the floodway. In such a case, the applicant cannot use Method 5 to support the permit application for the construction of the house because this method simply approximates the flood hazard area design flood elevation and does not determine the floodway. N.J.A.C. 7:13-9.7 describes when an individual permit can be issued in an approximated flood hazard area.

Method 1: Department delineation method

In many cases, the Department has promulgated flood mapping which indicates the flood hazard area design flood elevation and floodway limits along a regulated water. More than 2,500 miles of regulated waters have been delineated by the Department in this way. A list of these waters is provided in Appendix 2 of the Flood Hazard Area Control Act rules. If a Department delineation exists for a given water, then the Department delineation must be used for all applications. An applicant cannot use another delineation method provided in N.J.A.C. 7:13-3 to determine the flood hazard area or floodway limits. Under this method, the flood hazard area design flood elevation is that which is shown on the flood profile adopted as part of the Department delineation, and the floodway limit is that which is shown on the flood maps adopted as part of the Department delineation as shown in Figure 2.3 below (which has been colorized to help illustrate the various portions of the flood hazard area.)

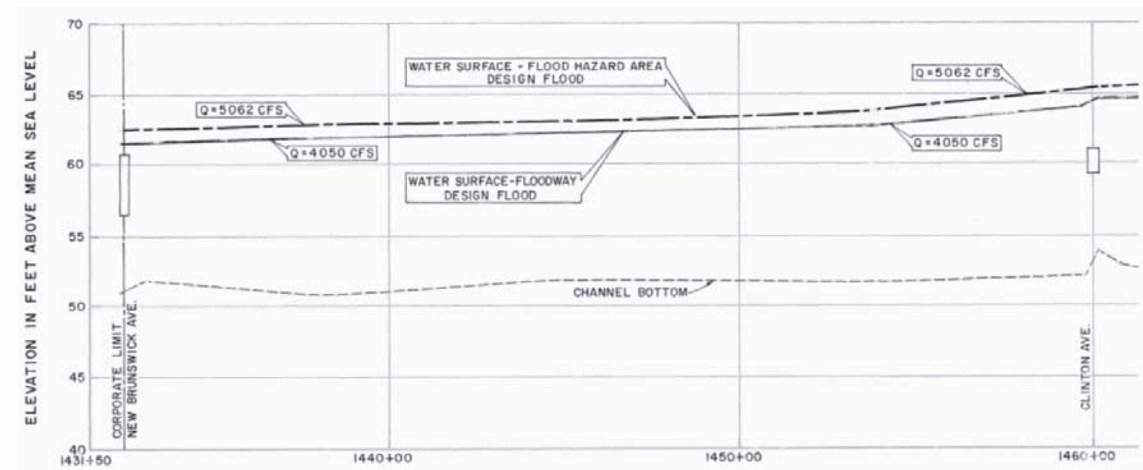
Figure 2.3



The floodway limits are exactly as shown on this map, and should be scaled directly off the map onto site plans. However, the flood hazard area and 100-year flood limits are only approximations based on the topography available at the time of mapping. Therefore, even if the mapping shows an area to lie within (or outside of) the flood hazard area, the actual extent of flooding on a site should be determined based on the ground elevation as compared with the flood hazard area design flood elevation.

To determine the exact design flood elevation at a given point, you should refer to the flood profile that accompanies the flood map (see Figure 2.4 below). Also note that in certain locations on the above example, the flood hazard area and 100-year flood limits are equivalent.

Figure 2.4



Requests for copies of a Department delineation, including flood profiles and maps, as well as any questions regarding the use, derivation or modification of these delineations, should be directed to the Department's Office of Floodplain Management at the following address:

State of New Jersey
Department of Environmental Protection
Bureau of Dam Safety and Flood Control
NJ State NFIP Coordinator's Office
P.O. Box 419
Trenton, New Jersey 08625-0419
Telephone: (609) 984-0859

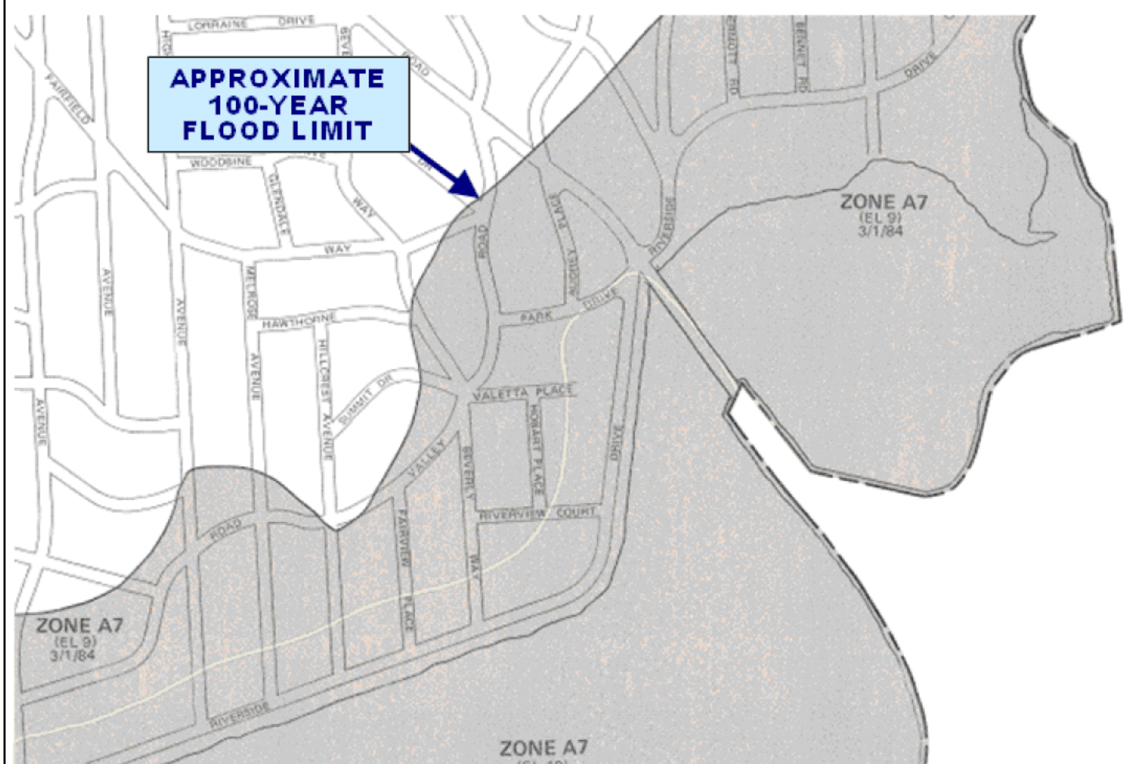
If an applicant disagrees with the flood hazard area design flood elevation and floodway limits shown on a Department delineation, an application can be made to the Department to modify the adopted mapping. This procedure is outlined at N.J.A.C. 7:13-13.4.

Method 2: FEMA tidal method

FEMA information may be used to determine the flood hazard area and floodway on a site under certain cases. There must be no promulgated Department delineation for the water on the site, and only the FEMA documents listed at N.J.A.C. 7:13-3.4(b) may be used. The Department will not accept a flood hazard area based on other FEMA information not described at N.J.A.C. 7:13-3.4(b), such as an unnumbered A-zone, because this does not provide a 100-year flood elevation. In addition, the FEMA information used must be the most recent available at the time of application and must not have been published by FEMA prior to January 31, 1980, since that is the date of the Flood Hazard Area Control Act and also because some earlier FEMA flood insurance studies may no longer be reliable indicators of the extent of the 100-year flood plain due to changes in methodology and development in the upstream watershed.

Figure 2.5 below is an example of a FEMA tidal flood map. The FEMA tidal method applies in areas where FEMA has established a tidal 100-year flood elevation. Under this method, the flood hazard area design flood elevation is equal to the FEMA 100-year flood elevation. There is no factor of safety added to the 100-year flood elevation in tidal areas.

Figure 2.5



Please note that, in many cases, floor elevations and roadways need to be elevated at least one foot above the flood hazard area design flood elevation under N.J.A.C. 7:13-11.5 and 11.6. The floodway limit is equal to the floodway limit shown on the FEMA floodway map. If no FEMA floodway map exists for the section of regulated water in question, the floodway limit shall be equal to the limits of the channel. Note that the Atlantic Ocean and other non-linear tidal waters such as bays and inlets do not have a floodway.

The shaded areas on the FEMA map have been approximated by FEMA to lie below the 100-year flood elevation. However, as noted in the discussion above, the actual limit of flooding is determined by ground elevations. Therefore, even if the flood mapping shows an area to lie within (or outside of) the flood hazard area, the actual extent of flooding on a site should be determined based on the ground elevation as compared with the flood hazard area design flood elevation. Also note that in some locations on this map the 100-year flood elevation is 10 ft NGVD while other locations the 100-year flood elevation is 9 ft NGVD. A thin white line separates these two areas on this map.

Method 3: FEMA fluvial method

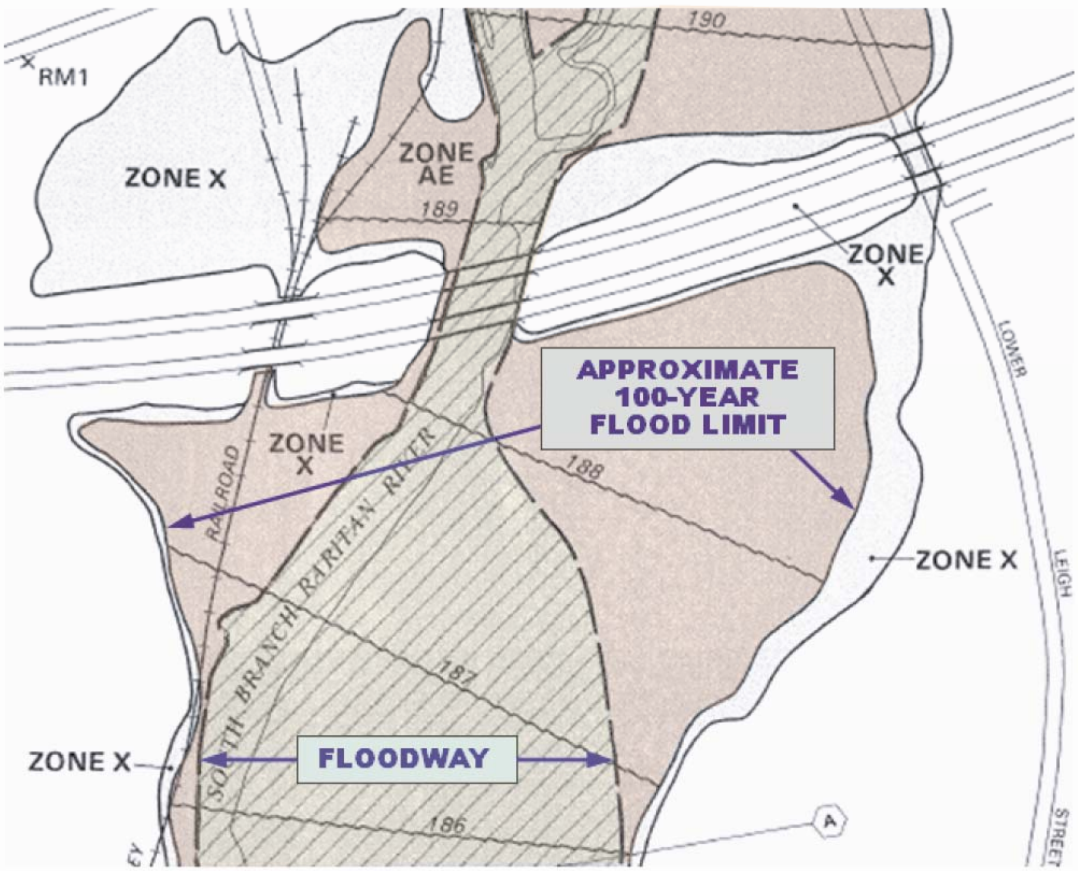
The FEMA fluvial method applies in areas where FEMA has established a non-tidal 100-year flood elevation. There must be no promulgated Department delineation for the water on the site, and only the FEMA documents listed at N.J.A.C. 7:13-3.4(b) may be used. As with Method 2, the Department will not accept a flood hazard area based on other FEMA information, such as an unnumbered A-zone, because this does not provide a 100-year flood elevation. In addition, the FEMA information used must be the most recent available at the time of application and must not have been published by FEMA prior to January 31, 1980, since that is the date of the Flood Hazard Area Control Act and also because some earlier FEMA flood insurance studies may no longer be reliable indicators of the extent of the 100-year flood plain due to changes in methodology and development in the upstream watershed.

Under this method, the flood hazard area design flood elevation is equal to one foot above the FEMA 100-year flood elevation. This one-foot factor of safety is added to ensure that the public is adequately protected if fluvial flood elevations rise over time. As noted above, in many cases floor elevations and roadways need to be elevated at least one foot above the flood hazard area design flood elevation under N.J.A.C. 7:13-11.5 and 11.6. Therefore, if the design flood elevation is based on Method 3, floor elevations and roadways would often need to be set two feet above the FEMA 100-year flood elevation.

Under this method, the floodway limit is equal to the floodway limit shown on the FEMA floodway map. If no FEMA floodway map exists for the section of regulated water in question, the floodway must be calculated using Method 4. Note that it is not always necessary to know the floodway limits in order to demonstrate compliance with the requirements of the Flood Hazard Area Control Act rules. See N.J.A.C. 7:13-9.6 for cases when the floodway must be delineated before the

Department can issue an individual permit. Figure 2.6 below is an example of a FEMA map for a fluvial area:

Figure 2.6



The colored areas (shown in gray on the actual FEMA map) have been approximated by FEMA to lie below the 100-year flood elevation. However, as noted in the discussion above, the actual limit of flooding is determined by ground elevations. Therefore, even if the flood mapping shows an area to lie within (or outside of) the flood hazard area, the actual extent of flooding on a site should be determined based on the ground elevation as compared with the flood hazard area design flood elevation. Also note that the flood elevation varies from 190 ft NGVD at the top of the map to 186 ft NGVD at the bottom. The wavy black line next to each elevation indicates the location where the corresponding flood elevation occurs. However, to determine the exact design flood elevation at a given point, you should refer to the flood profile that accompanies the flood map.

Method 4: FEMA hydraulic method

The FEMA hydraulic method applies in fluvial waters where FEMA has established a 100-year flow rate. As noted at N.J.A.C. 7:13-3.4(c)3, this method can only be used in certain cases. First, the FEMA flood insurance study must provide a 100-year flow rate for the regulated water. In most tidal flood hazard areas a large area is inundated due to flooding from the Atlantic Ocean, and therefore FEMA does not provide a 100-year flow rate for the regulated water itself. In such a case, it is not possible to use this method. Second, the applicant must be proposing a regulated activity in the flood hazard area (and must apply for an individual permit under this chapter), for which the Department requires hydraulic calculations comparing pre-construction and post-construction water surface elevations within the regulated water, in order to demonstrate that the regulated activity complies with this chapter. Examples of activities that require such an analysis are detailed at N.J.A.C. 7:13-11.1(f), 11.1(g), 11.7(c) and 11.7(d). Finally, there must be no promulgated Department delineation for the water on the site and, as with the other FEMA methods, only the FEMA documents listed at N.J.A.C. 7:13-3.4(b) may be used.

Under this method, the FEMA 100-year flow rate is used to determine the flood hazard area design flood elevation for a tidal flood hazard area, and 125 percent of the FEMA 100-year flow rate is used to determine the flood hazard area design flood elevation for a fluvial flood hazard area. Again, this factor of safety is necessary to account for the effects of future development in a fluvial area, but is not necessary for a tidal area since tidal flooding will not increase due to development.

The flood hazard area design flood elevation and floodway limit shall be based on a standard step backwater analysis using the appropriate flow rates. Furthermore, a hydraulic analysis shall be performed to determine the floodway limit using the 100-year flow rate reported by FEMA for the regulated water, assuming a maximum rise of 0.2 feet in the 100-year flood elevation. The floodway limits shall be calculated assuming equal conveyance reduction, unless the applicant demonstrates (prior to the submission of an application for a verification to the Department) that due to the topography of the area, the proximity of structures to the channel and/or other physical characteristics of the watershed or flood hazard area, use of another method will more optimally calculate the floodway limits at a given location.

Method 5: Approximation Method

An applicant can use this method to approximate the flood hazard area on a site where no Department delineation or FEMA mapping is available. The method is explained at N.J.A.C. 7:13-3.5 and its use is illustrated in Appendix 1 of the Flood Hazard Area Control Act rules.

In some cases, applicants do not need an exact delineation of the flood hazard area on their site in order to determine compliance with this chapter and, therefore, find it unnecessarily burdensome to determine the flood hazard area limits through calculations. For example, a person with a large site, who is proposing only a small activity (such as constructing a house, garage or shed) and is willing to place the activity anywhere on the site, might prefer a conservative estimate of the flood hazard area in order to avoid the flood hazard area altogether. In such a case, a quick and inexpensive estimate of the flood hazard area is sufficient, even if it is a conservative estimate, rather than an expensive and time-consuming, yet more exact, delineation. Therefore, Method 5 can be used to determine the flood hazard area on a site through a conservative approximation. However, since this method is conservative, in no case shall an applicant be required to use this method.

It should also be noted that Method 5 does not provide a floodway limit. The approximation method does provide an approximate flood hazard area design flood elevation, from which the limits of a flood hazard area can be determined. However, the limits of a floodway can only be determined using detailed hydraulic calculations, which are beyond the scope of the approximation method. In some cases, the Department needs to know the location of the floodway in order to determine compliance with a rule standard. In such cases, the Department cannot issue a permit for an activity in an approximated flood hazard area. Therefore, an applicant must sometimes use another method to determine the flood hazard area and floodway limits in order to obtain a permit. The conditions under which the Department can approve an individual permit in an approximated flood hazard area are discussed at N.J.A.C. 7:13-9.7.

The approximation method is based on an extensive analysis of USGS data, FEMA flood insurance studies and methods used by other states to approximate flood hazard areas. Data was collected from every detailed FEMA flood insurance study in the State in order to generate a logarithmic relationship between flood depth and drainage area. Equations were generated for each of the State's Watershed Management Areas (WMA), as shown in Figure 5 in Appendix 1, with an added factor of safety to ensure that the actual flooding along a given stream will not be greater than what this method approximates. The final computed values are shown in Table 1 in Appendix 1. The result is a consistent and conservative estimate of the depth of flooding, as measured from the average streambed elevation. This simple method of estimating the flood hazard area reduces applicants' expenditures and makes it easier for the public to determine the location and extent of flood hazard areas while ensuring that appropriate safeguards against flooding are in place.

In addition to the table in Appendix 1, another factor that is used to approximate the depth of flooding is the presence of any roadways that may cross the water downstream of the site. If a small culvert or bridge is located downstream of a site, floodwaters may back up and even overtop the roadway. In such a case, the depth of flooding can be higher on a site than indicated by Table 1. While some road crossings are designed to pass the 100-year flood, most crossings will cause some impediment to flow and will therefore raise flood elevations upstream of the structure to some degree. Railroad crossings, dams and other water control structures have a similar effect. In absence of hydraulic calculations for each structure, the conservative assumption must therefore be made that any crossing will impede flow and increase flooding to the point that water actually overtops the road surface. As such, an applicant must determine the elevation of the lowest point of each roadway or other water control structure that crosses the stream within one mile downstream of the site, which is known as the "low-point" of the crossing. Using Table 2 in Appendix 1, and based on the drainage area of the water, the flood depth in the vicinity of the crossing will be between one and three feet above the crossing's low-point. These depths were calculated using typical road profiles and flow rates for streams of various drainage areas. Figures 1 through 4 in Appendix 1 illustrate these concepts. It is the Department's experience that water control structures more than one mile downstream of a project rarely have a significant impact to flooding on the site and therefore do not need to be considered. However, if the Department is aware of an unusual condition that would indeed affect flooding, such as an extremely large and/or inadequate water control structure more than one mile downstream, N.J.A.C. 7:13-3.5(e) explains that the Department will not approve a general permit authorization or an individual permit for any regulated activity in the approximated flood hazard area, if such approval is determined to constitute a threat to public safety. Should an applicant choose to apply for a permit in such a case, the flood hazard area limit must first be calculated according to Method 6, as described at N.J.A.C. 7:13-3.6, which sets forth a more accurate means of determining the flood hazard area, in order to protect public safety.

The use of Method 5 is explained in greater detail in Appendix 1 of the Flood Hazard Area Control Act rules. To summarize, however, the approximated flood depth on a site will be either the depth shown in Table 1 of Appendix 1 or the depth shown in Table 2 of Appendix 1, whichever is higher. In order to use the approximation method, the applicant must know the drainage area of the water in question, and to which Watershed Management Area the water belongs. A topographic survey of the area in question must also be obtained, as well as the roadway elevations of any roads (or other water control structure) that cross the stream within one mile downstream of the site. An applicant can determine the Watershed Management Area by reference to Figure 5 in Appendix 1. The size of the drainage area can be determined using USGS maps.

As noted above, the approximation method is designed to be conservative, and, therefore, may in some cases overestimate the size of the flood hazard area. For this reason, an applicant is never required to use the approximation method, but may choose to use it under certain circumstances. Using detailed hydrologic and hydraulic calculations under Method 6 may result in a smaller and more accurate flood hazard area limit than can be provided using Method 5. An applicant is also limited in the type of construction the Department will permit in an approximated flood hazard area as discussed at N.J.A.C. 7:13-9.7. Thus, the applicant may instead choose to use Method 6, which provides more information, as discussed below.

There are also cases where the approximation method will not be useful. When flood storage volume calculations or hydraulic calculations are required to demonstrate that a proposed activity complies with the standards of the rules, the approximation method cannot be used because the approximation method does not provide a floodway limit or a peak flow rate. The approximation method is most useful in cases where no construction is yet proposed on site and a property owner wants to know the approximate extent of the flood hazard area in order to plan future development outside of it. The approximation method is also useful when a small project, such as a home or a stormwater outfall structure, is proposed in a flood hazard area. The approximation method provides a flood hazard area design flood elevation, which is needed in order to establish the lowest floor of the building under N.J.A.C. 7:13-11.5. Using the approximation method may force the building to be constructed somewhat higher than if the applicant used Method 6. However, a higher floor elevation usually results in lower flood insurance rates, and using Method 5 to determine the design flood elevation is often mush less costly than using Method 6. Therefore, Method 5 provides a cost-effective alternative to Method 6 in certain cases, while ensuring equal or better flood protection.

As noted above, the approximation method may be used only if no Department delineation or FEMA information is available, since those methods are more accurate. The drainage area of the water must also be less than 30 square miles. Most streams of this size have already been delineated by the State or FEMA. Furthermore, as the drainage area increases, it becomes more difficult to approximate the flood hazard area. Factors such as zoning, slope, land uses and level of development are harder to estimate for larger watersheds, and the FEMA data from which the approximation method was calculated was not always available in a given Watershed Management Area for larger waterbodies. Therefore the Department has limited the use of the approximation method to waters with drainage areas of less than 30 square miles.

An applicant may also choose to establish a flood hazard area limit that is even more conservative than the approximation method. An applicant may wish to do this to reduce surveying costs in an area that may not be developed. For example, a freshwater wetlands transition area limit may already be established by metes and bounds outside the approximated flood hazard area limit. The applicant could, therefore, choose to use the transition area limit as the approximate flood hazard area limit in order to save the time and money associated with establishing a separate flood hazard area limit with metes and bounds onsite. It should also be noted that the Department may not permit development within an approximated flood hazard area in rare instances in which Method 5 significantly underestimates flooding due to an unusual condition on or near the site (see N.J.A.C. 7:13-3.5(e))

As previously stated, the use of Method 5 is illustrated in detail in Appendix 1 of the Flood Hazard Area Control Act rules. However the following additional guidance may prove helpful:

- Step 1 directs the applicant to determine the Watershed Management Area in which the project is located. New Jersey is divided into 20 Watershed Management Areas as shown in Appendix 1, Figure 5. If an applicant is unable to determine the appropriate Watershed Management Area from Figure 5, the Department will assist in this determination. Contact information for the Department is listed at N.J.A.C. 7:13-1.1(f). Step 1 also directs the reader to Note 2, which explains the procedure if a project spans more than one Watershed Management Area. In such a case, the approximate flood hazard area must be determined separately within each Watershed Management Area.

- Step 2 directs the applicant to determine the drainage area of the water in question. N.J.A.C. 7:13-1.2 defines "drainage area" as the total area of land from which stormwater runoff will drain to a given point. The directions explain that USGS provides topographical mapping that can be used to make this determination and that the Department can also help in this determination at the applicant's request.

- Step 3 directs the applicant to determine the approximate depth of flooding from Table 1. Table 1 lists approximate flood depths based on Watershed Management Area and drainage area. Watershed Management Areas are listed in the first column of the table. Going from left to right in any row, each number represents the upper drainage area limit for the flood depth shown at the bottom of that column. For example, in the row for Watershed Management Area 10, a water with a drainage area of 70 acres or less has a flood depth of five feet. Similarly, any water draining between 70 and 110 acres has a flood depth of six feet. In the example illustrated with arrows on the table, a water with a drainage area of between 19.4 and 30.0 square miles in Watershed Management Area 10 has a flood depth of 18 feet. Flood depths are rounded to whole feet for ease of use and for an added factor of safety. Drainage areas in shaded boxes are measured in acres, while drainage areas in unshaded boxes are measured in square miles. The table does not give flood depths for drainage areas over 30 square miles because N.J.A.C. 7:13-3.5 does not allow the approximate method to be used for streams that drain over 30 square miles.

- Step 4 directs the user to find the low point elevation of each roadway crossing or other water control structure that crosses the stream in question within one mile downstream of the site. The presence of any roadways that cross downstream of the site is an important factor in determining the approximate flood depth. A culvert or bridge located downstream of a site may be too small to effectively pass water during a flood. In such a case, the roadway will act like a dam and cause floodwaters to back up and possibly overtop the roadway. If this occurs near a site, the depth of flooding on site would be higher than Table 1 indicates. In absence of hydraulic calculations, the assumption must therefore be made that any downstream roadway crossing will impede flow in the stream to the point that the roadway overtops. This is illustrated in Figures 1 through 4. The applicant must determine the elevation of the low-point (the lowest point) of each roadway that crosses within one mile downstream of the site. Consideration should also be made if the road crossing includes parapets and other structures that will not allow the entire roadway to act as a weir for the anticipated flood events. If a parapet is very wide, the top of the parapet should be used as the low point of the roadway. If a parapet is small in comparison to the width of the area that water could overtop, then it may be permissible to ignore the presence of the parapet when using Method 5. Applicants are encouraged to discuss such situations with the Department’s staff to receive guidance prior to submitting an application.

Based on the drainage area of the water, the flood depth will be between one and three feet higher than the low-point of the roadway as shown in Table 2 in Figure 1. It is unlikely that roadways crossing a stream more than one mile downstream of a site will affect flooding on that site. The depth of flooding over the roadway is measured above the lowest point in the roadway, since that is the point where floodwater will begin to overtop the road. Figure 1 also illustrates a typical roadway profile with a low point. Note 3 on the first page of Appendix 1 explains that the Department may determine that a large bridge across a stream will not affect flooding on a particular site. In such a case, the low-point of that bridge does not need to be determined.

- Step 5 explains that the approximate flood elevation will be equal to the depth shown in either Table 1 or Table 2, whichever is higher. It is necessary, then, to determine how these two elevations relate to one another. An applicant must be able to determine which of these two depths is higher, and therefore must measure both elevations from a common reference point. Elevations are typically measured according to an agreed upon datum, such as the National Geodetic Vertical Datum of 1929 (NGVD) or the North American Vertical Datum of 1988 (NAVD). Although approximate flood depths do not necessarily need to be measured from NGVD or NAVD, they must nevertheless be measured from the same datum as the topography onsite in order to be able to compare the approximated flood elevations with the elevation of the site.

- Table 1 gives flood depths measured above the average streambed elevation. The average streambed is the general "smooth" grade of the bottom of the channel, and does not include small pockets of erosion, individual boulders, or minor irregularities. The average streambed always has a positive slope toward downstream.

- Table 2 gives flood depths measured above the travel surface of any roadway that may cross the channel. The approximate flood depth is measured above the lowest point of the road surface as it crosses over the channel. The assumption is that the roadway embankment across the channel acts like a dam during a flood and that floodwaters will rise up and spill over the roadway to a certain depth. Table 2 provides the approximate flood depth above the low-point of the roadway based on the drainage area of the regulated water. If more than one roadway crosses a channel, the roadway with the highest low-point must be used, since that roadway will have the biggest impact on flooding. Figure 3 shows a profile of a stream with accompanying flood elevations from both Table 1 and Table 2. The flood elevation derived from Table 1 is measured above the streambed and the flood elevation derived from Table 2 is measured above the roadway.

- Figure 1 shows a profile of a typical roadway that is overtopped by floodwaters. This view is basically a slice down the centerline of a roadway, seen as if standing in the channel and looking at the roadway.

- Figure 2 shows a three-dimensional view of a typical flood plain with a roadway across a channel downstream of a house. The flooding associated with the stream itself (the depth of which is determined from Table 1) is exacerbated by the presence of a roadway, which creates an obstruction in the flood plain that causes additional ponding of floodwaters (the depth of which is determined from Table 2).

- Figure 3 shows a profile view of Figure 2. This view is basically a slice down the center of the streambed, seen as if standing along side the channel. The average streambed and the actual streambed are both illustrated. The roadway is shown crossing the stream, and from this perspective a car would be driving into (or out from) the page. The depths of flooding derived from both Table 1 and Table 2 are shown as well. Notice that immediately upstream of the roadway, the elevation of floodwaters due to the presence of the roadway (the depth of which is determined from Table 2) is greater than the elevation of floodwaters in the channel alone (the depth of which is determined from Table 1). However as the streambed rises in elevation upstream of the roadway, the flood elevation determined from Table 1 eventually exceeds the flood elevation determined from Table 2.

- Figure 4 shows a plan view (aerial view) of Figures 2 and 3. Topography is shown on this view. Note that the flooding from the roadway (from Table 2) is a constant elevation while the stream's actual flood elevation (from Table 1) rises as the stream bed rises.

- Figure 5 depicts New Jersey's Watershed Management Areas for use with Table 1.

- **Example:** Assume an applicant wishes to construct a house at a particular location along a stream and wants to determine the approximate flood depth at that location. The stream has a drainage area of 1.9 square miles. The site is located in Watershed Management Area 5. Table 1 therefore gives a flood depth of 9 feet above the average stream bed. The average stream bed elevation nearest to the house has been found to be 100 feet NGVD. Therefore, the approximate flood elevation according to Table 1 would be 109 feet NGVD at the proposed house site.

  However, two roads cross the stream within one mile downstream of the site. The low point of the first is 105 feet NGVD and the low point of the second is 108 feet NGVD. For a drainage area of 1.9 square miles, Table 2 gives a flood depth of two feet over the low-point of the roadway. The approximate flood depths for these roadways would therefore be 107 feet NGVD and 110 feet NGVD, respectively. Of all three elevations (109 feet NGVD from Table 1, and 107 feet NGVD and 110 feet NGVD from Table 2), 110 feet NGVD is the highest. Therefore, the approximate flood elevation at the proposed house site is 110 feet NGVD.

Method 6: Calculation Method

Method 6 can be used to determine the flood hazard area design flood elevation and floodway limits in any case where no Department delineation is available for a given site. In cases where neither a Department delineation nor a FEMA study is available, and where the approximation method cannot be used, the limits of the flood hazard area can only be determined by using this method.

The flood hazard area design flood under this method is equal to 125 percent of the flow rate of the 100-year flood calculated assuming existing development conditions in the upstream watershed. Department delineations were developed using this same flow rate (the 100-year flow plus a 25% factor of safety), and so this requirement is consistent with the Department delineation method (Method 1) as well as with the FEMA hydraulic method (Method 4).

Under this method, the flood hazard area design flood elevation and floodway limit shall be based on a standard step backwater analysis and determined as follows:

1. A hydrologic analysis shall be performed to determine the peak flow rate for the 100-year flood for the regulated water. The hydrologic analysis shall assume existing development conditions in the drainage area, as of the date of the application to the Department;
2. For a tidal flood hazard area, a hydraulic analysis shall be performed to determine the flood hazard area design flood elevation using the 100-year flow rate determined above;
3. For a fluvial flood hazard area, a hydraulic analysis shall be performed to determine the flood hazard area design flood elevation using 125 percent of the 100-year flow rate determined above; and
4. A hydraulic analysis shall be performed to determine the floodway limit using the 100-year flow rate determined above, assuming a maximum rise of 0.2 feet in the 100-year flood elevation. The floodway limits shall be calculated assuming equal conveyance reduction, unless the applicant demonstrates (prior to the submission of an application for a verification to the Department) that due to the topography of the area, the proximity of structures to the channel and/or other physical characteristics of the watershed or flood hazard area, use of another method will more optimally calculate the floodway limits at a given location.

2.3 Establishing Flow Rates

For the purposes of floodplain analysis, hydrology is the evaluation of the runoff from a specific area based on factors such as rainfall, land use, surface storage, slope and soils. Hydrologic analysis typically results in establishing the peak runoff, the runoff volume, and the distribution of the runoff over time into a hydrograph. While floodplain hydrologic analyses will often focus on the 100-year storm event and the flood hazard area design flow to establish the limits of the flood hazard area, other events may need to be analyzed to demonstrate the impact of a particular development on adjacent properties and/or the receiving water. In order to address stormwater management and soil erosion, the 2, 10, 25 and 100-year pre-and post-development runoff from a site are often evaluated. To establish the flood hazard area, 125% of the 100-year storm may need to be determined. In addition, there are events that may be critical to a particular structure that are outside the standard rain events but may cause the greatest impact if amended. For example, a culvert may serve to store flood volumes between the 3-year flood and 9-year flood, but overtop at the 10-year flood. Analyses limited to the 2 and 10-year storms may therefore fail to capture the impacts that losses in storage may incur on a downstream property owner for those non-standard storm events. In this example, the storm event that may result in the greatest loss of storage or the greatest relative increase in downstream peak flows is the critical storm.

2.3.1 Models

There are many hydrologic models available to establish the flood hazard area design flow and other flow rates used in the Flood Hazard Area Control Act rules. Table 2.1 below list some of the typical peak flow determination techniques for either gauged or ungauged drainage areas.

Table 2.1 Peak Determination Methods

Gauged Sites	Ungauged Sites
Log Pearson Type III Distribution	Transfer Equation
Normal Distribution	USGS Regression Equations (SR 38)
	NRCS Discharge Method
	Rational Method

This section will discuss some of the commonly used methods and will identify some issues that should be considered when using these methods.

Flow Gauges

The United States Geological Survey (USGS) has gauges that record the flow data for many streams in the State. The USGS has developed equations and programs that allow the use of the gauge data to project the flows for specific storm events, such as the 100-year storm, that can be utilized in establishing the flood elevations. Additional information about gauge data and available USGS programs for establishing flow rates is available at nj.usgs.gov.

Transfer Equations

Since gauges are rarely located at the exact point in the watercourse where the flow information is required, a method is needed to transfer flow information from the point from where it is measured to the point where the data is desired. To accomplish this, the design flood at the point of interest should be obtained from the design flood determined using USGS methodologies in the following manner:

$$\frac{Q_{P.I}}{Q_{P.G.}} = \left[\frac{A_{P.I.}}{A_{P.G.}}\right]^{0.75}$$

Where

$Q_{P.I.}$ = The design flood at the point of interest (cfs)

$Q_{P.G.}$ = The calculated design flood at the gauged point (cfs)

$A_{P.I.}$ = Drainage area in square miles at the point of interest (mi^2)

$A_{P.G.}$ = Drainage area in square miles at the point gauged (mi^2)

The exponential factor of 0.75 is based upon studies of 10-year recurrence interval storms in New Jersey by the Department. However, in certain cases, the applicant may propose (or the Department may require) the use of different exponential factors provided adequate data to substantiate the same is available. It is important to note that good engineering judgment should always be applied. In addition, some of the constraints or limitations to the use of this transfer equation include the following:

1. The transfer equation should not be used to obtain design flows upstream if the gauged data reflects recent withdrawals, containments, etc., which exist between the gauged point and the point of interest.

2. Transfer should not be applied if the transfer point has a drainage area more than twice than, or less than half of, the drainage area at the gauge location.

Special Report 38

Special Report 38 (SR-38), also entitled "Magnitude and Frequency of Floods in New Jersey with Effects of Urbanization," was prepared by the USGS in cooperation with the Department. The formulas in this method may be utilized to establish flood flows for urban drainage areas of greater than one square mile. SR-38 derives flow rates based on the size of the drainage area feeding the watercourse at the point in question, the slope of the main channel in the drainage area and the amount of surface water storage in the drainage area, as well as the percentage of manmade impervious cover for the area involved. The first three of the above-mentioned factors are to be calculated in accordance with the procedures outlined in SR-38 from the USGS Quadrangle Maps. The surface water storage factor should be determined considering the current zoning and developability of existing storage areas. In addition, the applicant should clearly indicate (on quadrangle maps) the drainage area and those areas considered as surface water storage for computational purposes (See SR-38 for details).

The last factor, namely impervious cover, has been correlated directly in SR-38 with population both by formula (Table 3) and by nomograph (Figure 9). Impervious cover or population density shall be computed based on existing conditions with increases for full development proposed by the applicant, as well as consideration of all other development or construction in progress in the drainage area. In addition, all plans or development presently under consideration or anticipated for consideration in the next five years by municipal planning boards within the drainage basin, shall be considered in the impervious cover value. Municipal population data for the drainage area involved shall be obtained from the New Jersey Department of Labor and Industry, Office of Business Economics, and shall be used in determining population density. Where the above data does not provide sufficient detail, other data and other recognized methods of estimating population may be used.

In addition to the above method for calculating population density, it shall also be determined by the following formula developed by the New Jersey Builders Association:

$$D_f = D_e + D_u A^{-0.3}$$

Where

D_f = basin population density (persons per mi^2) for the purpose of establishing possible future flood discharge.

D_e = the existing basin population density (persons per mi^2)

D_u = increase in population density (persons per mi^2) that could occur if the entire basin were to be developed on the basis of existing zoning and land use planning; and

A = the upstream drainage basin (mi^2) or 100, whichever is less

If D_f (as determined above) is greater than the population density determined by the previously described method, then it shall be used in the determination of the design flood discharges (i.e., the larger of the two calculated population density figures governs.)

Note: As of the publication date of this manual, USGS, with funding provided by the NJDEP, Bureau of Dam Safety & Flood Control, is in the process of updating the methodologies for establishing stream flow statistics for user selected sites on streams. Users should utilize the latest official version of these methodologies available from USGS when establishing design flow rates.

NRCS method

The NRCS method is developed by the USDA Natural Resources Conservation Service and is perhaps the most widely used method for computing stormwater runoff rates, volumes and hydrographs. It uses a hypothetical design storm and an empirical nonlinear runoff equation to compute runoff volumes and a dimensionless unit hydrograph to convert volumes into runoff hydrographs. The methodology is particularly useful for comparing pre- and post-development peak rates, volumes and hydrographs. The key component of the NRCS runoff equation is the NRCS Curve Number (CN), which is based on soil permeability, surface cover, hydrologic condition and antecedent moisture. Watershed or drainage area time of concentration is the key component of the dimensionless unit hydrograph (New Jersey Stormwater Best Management Practices Manual, Page 5-4).

Many proprietary and non-proprietary hydrology programs incorporate the NRCS methodology, including HEC-1, HEC-HMS and TR-20. A complete description of the NRCS methodology can be found in the NRCS National Engineering Handbook Section 4 – Hydrology. A detailed discussion of the methodology is also available in Technical Release 55 (TR-55), entitled "Urban Hydrology for Small Watersheds." Additional information on this and other engineer methods is available from the USDA at www.nj.nrcs.usda.gov/technical/engineering/.

HEC-1 and HEC-HMS

The HEC-1 program was developed by the Hydrologic Engineering Center (HEC), Corps of Engineers, California District, in 1967. The HEC-1 program models the surface runoff response of a drainage basin or watershed to precipitation by representing the area as either a single basin or an interconnected system of sub-basins. The HEC-1 model will produce a hydrograph at desired locations in the basin and accounts for changes in flow rate over time (hydrograph) and associated changes in storage volumes, which can affect downstream flood elevations. HEC-1 yields reasonable results for the basin modeled because it can account for the attenuation due to storage. The US Army Corps of Engineers has also developed a graphical user interface version of HEC-1, along with additional upgrades, called HEC-HMS (Hydrologic Modeling System). Details regarding the use and capabilities of this software is available at: www.hec.usace.army.mil/software/hec-hms/.

Note: It must be remembered that the accuracy of a model and its resulting output are a reflection the level of effort put into the development of that model. The input data and output must be continuously reviewed to insure that the results are reasonable.

Methods other than those outlined above are available to establish flow rates, which may be appropriate to use for a particular project. Designers wishing to use an alternate method should contact the Department early in the design process to determine whether a particular method is acceptable.

2.3.2 Special Considerations for Flow Rates

Each hydrologic methodology has areas of applicability and non-applicability. Some methods are limited by land use, some by drainage area and others by the ability to model existing flood storage. Users should ensure that the hydrologic method selected is appropriate to the conditions being assessed.

Certain factors must also be considered when developing a hydrologic analysis to establish stream flows. Drainage areas may have changed due to development not reflected by the available topographic mapping. For example, portions of a drainage area may be diverted by a flood control project. Depressed areas that formerly provided flood storage may have been re-contoured, and land uses outside of the applicant's property may have changed. It is important to evaluate whether the topographic mapping used to establish the drainage area and other factors in the hydrologic computations are accurate as depicted.

2.4 Determining Flood Elevations and Flood Routing

Performing a hydraulic analysis is the second step of Method 6 (calculation method) which is used to determine the limits of the flood hazard area and floodway when a State or FEMA delineation of a stream is not available. It is also necessary for projects in which an applicant must show the difference in flood elevations from existing to proposed conditions, such as under Method 4 (FEMA hydraulic method), or in cases where there is a Department delineation (Method 1) and such comparative calculations must be performed.

Applicants proposing projects that are likely to result in increased water surface elevations or velocities with a potential for soil erosion are generally required to submit hydraulic calculations adequate to facilitate the comparison of the existing and proposed conditions. Such projects may include the placement of new bridges, culverts channel modifications, and any other project that would alter the hydraulic capacity of the channel or floodway.

The delineation of a flood hazard area is typically based upon a one-dimensional analysis using standard step methodology. There are times, however, when watercourse hydraulics may be affected by the presence of obstructions. Such obstructions may include hydraulically inadequate railroad embankments and in-watercourse impoundments, such as lakes, dams, or existing on-stream detention facilities. The presence of these types of obstructions can cause greater inaccuracies in the determination of a water surface profile along a given reach of a watercourse. When modeling a flood hazard area for a reach of a watercourse that contains such obstructions, the modeler has several options concerning how to proceed.

In light of the above, the applicant may choose to simplify a flood hazard area delineation model by not accounting for any flow rate attenuation provided by these types of obstructions. In so doing, a more conservative flood hazard area delineation may result. Furthermore, when developing flow rates for the purposes of establishing a flood elevation for a verification, the Department typically would not allow the design engineer to use upstream inadequate bridge or culvert crossings to attenuate the rate of flow upstream of an area of interest. This is intended to provide a factor of safety in predicting the flood capability of a water on a given site.

However, in certain cases, the Department may require the design engineer to perform a flood routing. An example includes a proposed bridge/culvert crossing wherein the structure will be made more efficient. Another example includes a scenario wherein a property of interest is located upstream of an inadequate bridge/culvert. In the former case, the Department would be concerned with the possibility of a storage loss/increase in downstream flow rate that may result from the proposed structure. In the latter case, the Department may be concerned with backwater effects associated with the inadequate structure.

Despite the above, some upstream flow obstructions may be routed. This is true for situations where upstream inadequate railroad embankments or upstream impoundments exist, such as lakes, dams or on-stream detention basins. This allowance does not apply to inadequate roadway crossings because of the greater likelihood that roadway crossings would be upgraded to more hydraulically efficient structures than would these other structures. Where routings are performed, the applicant must submit all sizing and routing information in report form and on design drawings such that the Department may verify the validity of the routing.

Note that in certain circumstances, including those when channel modifications are proposed, or when inadequate bridges or culverts are replaced with more hydraulically efficient structures, the Department may require routings to be performed. However, these routings would normally be performed at the proposed area of impact but not at other hydraulically inefficient roadway crossings. This is required to enable a better assessment of the hydraulic impact that would result from the upgraded structure.

Many methodologies exist for use in watercourse routing, which can be classified into two types: hydrologic routing and hydraulic routing. This scope of this manual prevents a comprehensive listing of the available methodologies, nor does this manual provide a comprehensive list of the limitations particular to each methodology. Instead, this manual serves to illustrate the type of information that must be considered when selecting from the various methodologies. For detailed information concerning the applicability and limitations of each methodology, the user is referred to hydraulics textbook and the following websites:

www.hec.usace.army.mil/publications/pub_download.html

www.usace.army.mil/publications/eng-manuals

It is noted that failure of the applicant to provide sufficient documentation, including supporting calculations and drawings, or to adequately explain the assumptions used in the creation of the model, or to be unable to adequately explain the results obtained from the use of the model, may result in the Department disqualifying the use of said methodology for the purpose of obtaining a flood hazard area verification or permit.

Acceptable methodologies used for hydrologic routings include, but are not limited to, the Modified Puls method for reservoir or channel routing, the Muskingum method, the Working R&D methods, and the Muskingum-Cunge channel routing method. Acceptable hydraulic routing methodologies include, but are not limited to, the kinematic wave equations, the diffusion wave approximation, and quasi-steady state dynamic wave approximation. Any model based on the above methodologies is acceptable for use, provided that the assumptions of the model are clearly stated in the application, and provided that all relevant computations and engineering drawings are submitted to verify the model during application review.

Typically, hydrologic routings are appropriate in situations where there are either no or very insignificant backwater effects along a given reach of stream. However, certain hydrologic routing methodologies, including Modified Puls, can accommodate backwater effects. At the same time, this methodology loses accuracy when the assumed level pool stores a comparatively small volume of water compared to that being conveyed in the flood wave. Similarly, it is noted that hydrologic models tend to lose accuracy in instances where the flood wave travels across flood hazard areas, when there are wide flood hazard areas, when watercourse slopes are less than 2 feet per mile, when there is a sudden spike in the water surface profile, when the tidal flood wave becomes a factor, or when multi-directional flow paths are apparent. In consideration of factors such as these, it is important to consider the limitations of each type of methodology when a routing is proposed. If hydrologic modeling is not acceptable, then hydraulic methods, generally considered to be more accurate, must be employed. In some instances, multi-dimensional models may be required over simpler one-dimensional models. Factors to consider in the selection of the appropriate routing technique include channel slope, availability of hydrograph data, presence of backwater conditions and propagation of the flood wave out of the watercourse bank.

It is important to note that not all of the methodologies listed above can adequately address these different situations. Because of this, the user is referred to published documentation concerning each of the listed methodologies. Consequently, the user should provide the Department with adequate justification as to why the selected methodology is appropriate for a given reach of a watercourse.

Manning's Equation

This section briefly outlines the use of Manning's equation for normal depth flood computations. Further discussion and illustration of the proper use of this equation can be found in *Open-Channel Hydraulics,* by Ven Te Chow, published by McGraw-Hill. The Manning's equation has limited uses, since it does not take into account the backwater influence caused by downstream obstructions to flow or influences caused by channel bends or certain other hydraulic conditions.

Manning's equation is often used to determine the starting water surface elevation for various hydraulic models if the channel is of uniform cross-section and slope, and it can be demonstrated that flow is not affected by backwater caused by downstream obstructions. This starting water surface elevation should be determined at least 500 feet downstream of the site, and the hydraulic analysis should continue upstream through the site. For generating water surface profiles, computations should have a minimum of five cross-sections.

In limited cases, the Manning's equation may be used to establish the limits of the flood hazard area, where the stream channel is relatively uniform and straight, has a uniform slope, and it is clear that the flow is not affected by backwater from any downstream obstruction. The Department should first be consulted for confirmation that Manning's Equation is an appropriate method for use for a given project.

Standard Step Method

A conventional method for calculating water surface profiles under both existing and proposed conditions is the Standard Step Method. Since the use of hand calculations is tedious, most engineers opt to use computerized versions to set the limits of the flood hazard area. Under this method, the location and alignment of cross-sections are very important because they describe the geometric model of the riverine system, which is the basis for the entire series of computations. Contour lines are used in orienting sections perpendicular to the expected current directions, and the results often require angle points to model both channel and overbank flow. None of the cross-sections should intersect. Hydraulic roughness values should be obtained from field observation and not from topographic mapping. Furthermore, the roughness values should be shown on each cross-section as they are helpful in locating where a cross-section should be subdivided to determine distributed properties.

HEC-2 and HEC-RAS Computer Programs

These program were developed by the Hydrologic Engineering Center (HEC), Corps of Engineers, California District. The HEC-2 program was developed to calculate water surface profiles for steady flow in natural or man-made channels under subcritical and supercritical flow conditions. Many of the original State-delineated watercourses relied upon HEC-2 to determine flood plain elevations. The effects of various hydraulic structures such as bridges, culverts, weirs, embankments and dams may be considered in the computation. The principal use of the program is for determining flood profiles (as it applies Manning's Equation in the Standard Step Method) for various frequency floods for both natural and modified conditions. The Hydrologic Engineering Center River Analysis System (HEC-RAS) model is part of the next generation of hydrologic engineering software developed by the Corps of Engineers. The HEC-RAS program is an update to HEC-2 and is the most commonly utilized software for standard-step backwater analyses. The availability of a graphical user interface allows a more comprehensive view of the impacts of particular structures and geometries on the water surface elevations.

Both models deal with instantaneous peak flows, and assume that that the flow rate is uniform unless the user changes it. Storage is not accounted for in the computations, so these programs are best suited for evaluating backwater effects upstream of a site that may be caused by construction in the flood hazard area, and not for the evaluation of downstream impacts to the flood elevation caused by the loss of storage or the opening of a constriction to flow.

It should be remembered that the accuracy of the output will reflect the level of effort put into the development of that model. The input and output data must be reviewed continuously to insure that the results are reasonable. It is also recommended that, prior to using these programs to analyze a watercourse, the novice user attend one of the many seminars offered on their use, so that the user can appreciate the complexity of these programs and therefore use them more effectively.

Input data should be reviewed to insure the correctness of the following major parameters:

1. Discharges.
2. Manning "n" Values.
3. Expansion and contraction coefficients.
4. Starting conditions.
5. Cross-sections are placed at control points in the watercourse and not just set at a uniform spacing, starting 500 ft downstream of the site and continuing 500 ft upstream of the site.
6. Cross-section data must be based on field surveyed topography, which must be submitted on engineering drawings.
7. Bridges and culverts are modeled with an adequate number of cross-sections based on the method under which the program will analyze the structure and that the expansion and contraction zones upstream and downstream are properly represented in the coding of those cross-sections.

Similarly, the output data should be reviewed to insure that the following are reasonable:

1. All error messages generated are investigated and the reason for their generation determined and addressed.

2. Generated water surface elevations - Starting water surface elevations and computed profiles should be compared with observed historic high water marks wherever possible. Generated water surface elevations should be evaluated to insure that sufficient cross-sections have been included to adequately model the reach of river being investigated.

3. Top width of cross-sections - Check to insure that calculated top widths agree with the topography used to generate the input.

4. Depth - Check if calculated depths are reasonable.

5. Output for each cross-section - Discharge and velocity distributions must be checked to insure that the cross-section data represents effective flow area required for correct water surface profile generation and encroachment determinations.

6. Analysis of computer solutions at structures - The output should be checked to insure that the model realistically reflects appropriate top widths, flow distributions and levee control for the flow conditions encountered. The evaluated flow should be confined to channels in the adjacent cross-sections levee control only when either low or pressure flow is encountered. When low flow or high submergence is encountered, data should be checked into insure that the normal bridge routines have been utilized.

Similar to HEC-2, HEC-RAS requires a detailed review of the input data to ensure adequacy of the output data. The basis for the starting water surface elevation selected must be included. Other critical data include cross-sectional geometry, flow rates, Manning's "n" values and reach lengths to convey accurate meanders. Where a bridge or culvert acts as a control structure, survey data of these areas utilized as input must be included. While application information often contains the upstream and downstream faces of the bridge or culvert, the location and elevations of the effective weirs that control the water surface elevations are rarely included. This is critical to the analysis and the review where such structures are overtopped. Caution should be exercised when converting bridge data from HEC-2 to HEC-RAS since errors often occur. HEC-RAS also allows the user to specify subcritical, critical and mixed flow regimes where appropriate. An electronic copy of the HEC-RAS input file should also be included with the application to enable a more efficient review of the submitted computations.

Floodway calculations

The establishment of floodway limits is often necessary to identify the limits beyond which fill and aboveground structures cannot be placed, and to demarcate the boundary between the floodway and the flood fringe. Floodway and flood hazard area limits must be labeled and described by metes and bounds and should be tied into the property lines.

As described at N.J.A.C. 7:13-3.4(f)1iii for Method 4 (FEMA hydraulic method) and N.J.A.C. 7:13-3.6(c)4 for Method 6 (calculation method), floodway limits should be based on a standard step backwater analysis, using the 100-year flow rate for the regulated water, assuming a maximum rise of 0.2 feet in the 100-year flood elevation. Floodway limits shall be calculated assuming equal conveyance reduction, unless the applicant demonstrates (prior to the submission of an application for a verification to the Department) that due to the topography of the area, the proximity of structures to the channel and/or other physical characteristics of the watershed or flood hazard area, use of another method will more optimally calculate the floodway limits at a given location. In other words, to determine the floodway, the encroachment should not increase the water surfaces more than 0.2 foot at any natural valley cross-section. However, the conveyance should be reduced equally from both sides. The floodway analysis should not encroach more on one side of the floodway than the other (as this results in an artificial shifting of the floodway), except as provided in the Flood Hazard Area Control Act rules as described above.

A number of hydraulic methodologies are acceptable for use in establishing floodway limits. For projects involving large watercourse reaches, the use of the HEC-2 or HEC-RAS computer program is recommended. In order to save time and unnecessary effort, applicants should consult the Department's engineering staff regarding the availability and use of a particular methodology before proceeding with project design. The encroachments should be the results of a Method 4 analysis followed by an optional Method 1 analysis. However a Method 4 analysis must be submitted for comparison. The velocity distribution at each natural cross-section should be reviewed to check the validity of effective flow areas utilized in the analysis. Encroachment models that show a potential for excessive velocities creating a potential for erosion will not be allowed.

It should be noted that establishing floodway limits by hand using the equal conveyance method may also be used. Although tedious if used for many cross-sections, this method may be useful in cases where the floodway limits are needed at only one or two cross-sections.

When the computed water surface elevation is below critical depth, it can be assumed that supercritical flow will exist. If supercritical flow exists at several sections, computations can start at the upstream limit of the model and proceed downstream through the same set of cross-sections. In this case, the rating curve for the upstream boundary must be available to obtain starting water surface elevations. For supercritical flow profiles, there should be no further encroachments to establish the floodway. The floodway in such cases should be set at the limits of the critical or supercritical flood hazard area limits.

HEC-5

Hydraulic Design Series No. 5, "Hydraulic Design of Highway Culverts," is published by the US Department of Transportation, Federal Highway Administration. This publication combines the information and methodology contained in Hydraulic Engineering Circular No. 5, "Hydraulic Charts for the Selection of Highway Culverts" and other more recent information developed by governmental agencies, universities, and culvert manufacturers to produce a comprehensive culvert design publication. The reference may be used when computing the water surface elevations upstream of a control structure such as a bridge or culvert under a road. It is also useful in determining the change in water surface elevations when replacing a bridge or culvert, since calculations can be done for both existing and proposed conditions. The method is furthermore useful in determining starting water surface elevations for a HEC-2 or HEC-RAS model when there is a water control structure downstream of a site. The applicant must first check the inlet control charts to determine the head assuming inlet control. The applicant must next check the outlet control charts to determine the head assuming outlet control. The actual elevation to be used is the higher of the two elevations. Complete details of any such calculations must be submitted with applications to the Department.

Loss of storage and impacts to downstream property

One potential major impact of a bridge or culvert replacement is the possible resultant increase in discharges downstream of the structure. For example, if an existing bridge or culvert is hydraulically insufficient to carry the design flood, the area upstream of the structure will function as a detention basin by partially holding back the flow from downstream areas. If this bridge or culvert is replaced, then potential impacts to downstream lands and structures must be considered. In such a situation, the Department would require a routing to be performed through the structure to be replaced. This would enable an assessment of the hydraulic impact of the proposed structure. As stated previously, the routing may only include the structure in question and any upstream obstructions, included inadequate railroad embankments, lakes, dams, or on-stream detention basins, but not other upstream, inadequate roadway crossings.

Generally, HEC-2 and HEC-RAS computer models are steady state models and these models will not take into account any attenuation that occurs in areas with large storage potential. Hence, replaced culverts will still show the same flow and the same water surface elevations downstream of the control structure. In order to adequately model the changes, a combination of routing and backwater calculations will be necessary. First, a HEC-1 analysis or another routing analysis, such as ones used to model detention basins, must be used to calculate the flow that actually passes through the existing bridge or culvert structure. Another similar analysis of the proposed bridge or culvert is necessary to show what increase or decrease in flow will result from the placement of the new structure. The existing and the proposed flows downstream of the structure to be replaced must then be coded into a hydraulic analysis similar to HEC-2 or HEC-RAS. These programs will then illustrate the proposed increases to the water surface elevations. A multiple run profile with a range of flows should be coded into the program to assess the impacts on a range of flood events. Flow rates to consider in the multiple run profile include those in which the existing structure acts under open channel flow only, pressure flow, and finally pressure and weir flow.

For the analysis and hydraulic design of most new bridges and culverts, or replacement bridges and culverts which will have a more restrictive opening, the existing flood hazard design flood water surface profile is generated first. The flood hazard area design flood water surface profile for proposed conditions is then computed to ensure that the proposed conditions will not increase flooding over existing conditions outside of the applicant's property, and also to ensure that capacity and freeboard restraints described earlier are met. For the analysis and hydraulic design of replacement bridges and culverts that will have larger openings, the existing flood hazard design flood hydrograph is generated first. The hydrograph must then be routed through both the existing and proposed structures to determine the change in the peak flow. The flood hazard design flood water surface profile for the existing and proposed conditions (using the existing and proposed flows) is then computed to determine the impacts downstream. Similar routings must be performed considering the entire range of flow rates in which a hydraulic impact is expected given the new geometry of the replacement structure. This includes flow rates wherein the existing structure acts under open channel flow only, pressure flow, and finally pressure and weir flow.

2.5 Stormwater Management

Major developments are required to comply with the standards of the Stormwater Management rules at N.J.A.C. 7:8. A major development is defined as any project that results in the addition of at least 0.25 acres of impervious surface, or which disturbs at least one acre of land. Refer to N.J.A.C. 7:8 and to the Frequently Asked Questions posted on www.njstormwater.org for additional guidance concerning how major developments are determined. The guidance regarding the application of the standards of N.J.A.C. 7:8 is available through the New Jersey Stormwater Best Management Practices Manual.

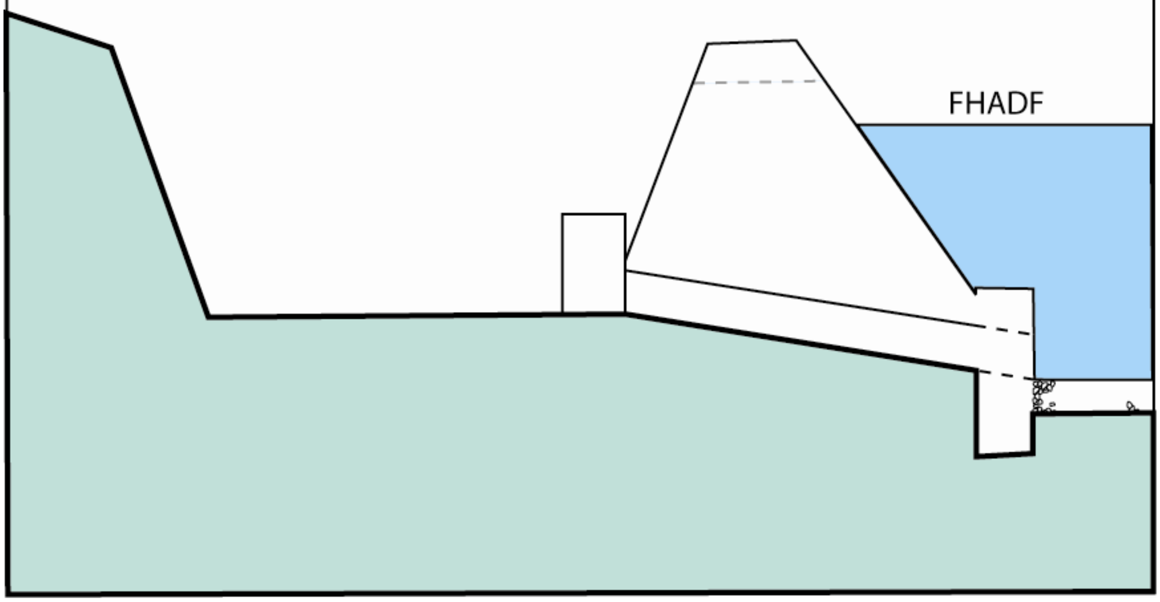
2.5.1 Stormwater Basins within the Flood Hazard Area

Stormwater management basins are typically designed to be located outside the flood hazard area. However, due to limited space for development and other constraints, stormwater management basins may be located within the flood hazard area.

A basin is generally designed to retain or detain certain volumes of stormwater and/or to discharge stormwater at a particular rate. Typically, basin outlet structures are designed assuming free flow at the outlet and that the full basin volume is available for storage. However, a basin or its appurtenances are sometimes placed below the flood hazard area design flood elevation. In such cases, the basin may function differently in a flood condition than in normal flow conditions, with or without a free flowing outlet. This section will focus on adjustments necessary to demonstrate that the design of a stormwater management basin located at or below the design flood elevation has sufficiently addressed the impacts of flooding on the basin design as required at N.J.A.C. 7:13-11.2.

A stormwater management basin and its associated appurtenances may be constructed below the flood hazard area design flood elevation. However, such a design must take into consideration the function of the basin during both flood and non-flood events. The rate of discharge from the basin may be significantly reduced by the tailwater conditions of the receiving water. “Tailwater conditions” refer to the water surface elevations found at the basin discharge during different flood events.

Figure 2.7



Typically, outlet structures are assumed to discharge under free flow conditions, with no constraint on the outflow due to the elevation of the receiving waters, and the basin volume is designed accordingly. However, the reduced flow through the outlet due to the elevation of the receiving water may result in inadequate basin storage to hold the anticipated maximum basin volume. Outflow from the basin is controlled by the difference between the elevation of the runoff in the basin and the elevation of the receiving water. The stage-discharge table for the basin must reflect flows assuming the maximum anticipated elevation of the receiving water for each design storm. These values should be used in the routing to determine that the basin has adequate volume to ensure compliance with the quantity requirements of the Stormwater Management rules during each flood event.

In some cases, the stormwater management basin volume does not have to be reduced as a result of the floodwaters entering the basin before runoff from the development enters the basin. Due to the short travel time to the basin, the basin may fill and exceed the flood elevation earlier in the storm event, in which case flooding will not result in a loss of available basin storage. The design engineer should discuss whether this assumption was utilized in the basin's design and whether it is appropriate for a particular site. If basin storage is lost due to inflow from the receiving water, additional computations and adjustments to the basin design should be documented to the Department.

The change in the stage-discharge table discussed above addresses the maximum storage needed to ensure the basin functions as designed. However, while conservative for storage requirements, there will be occasions when the receiving water body will not be at the peak elevation and the increased storage will not be utilized. Under this scenario, since the elevation of the receiving water at the outlet does not inhibit the flow rates through the outlet structure, the discharge for each stage will generally be higher than when flooding controls the outflow. It is important to ensure that the design engineer also demonstrates compliance with the required peak rates of runoff assuming the normal water surface elevation in the stage-discharge table to ensure the stormwater management criteria are met during non-flood events. The evaluation of a basin below the flood hazard area design flood elevation must be done using both methods, to ensure that the necessary volume and peak attenuation are provided during both flood and non-flood conditions.

N.J.A.C. 7:13-11.2(c)3 also requires emergency spillways to be constructed above the flood hazard area design flood elevation where feasible. This is necessary to prevent floodwaters from overtopping the berm and flooding the basin. The assumption of available volume is predicated on the inflow to the basin filling significantly faster than the floodwaters. However, if the basin is overtopped by the floodwaters through the emergency spillway, there will be no room inside the basin to receive and detain stormwater runoff from the development that the basin is constructed to serve.

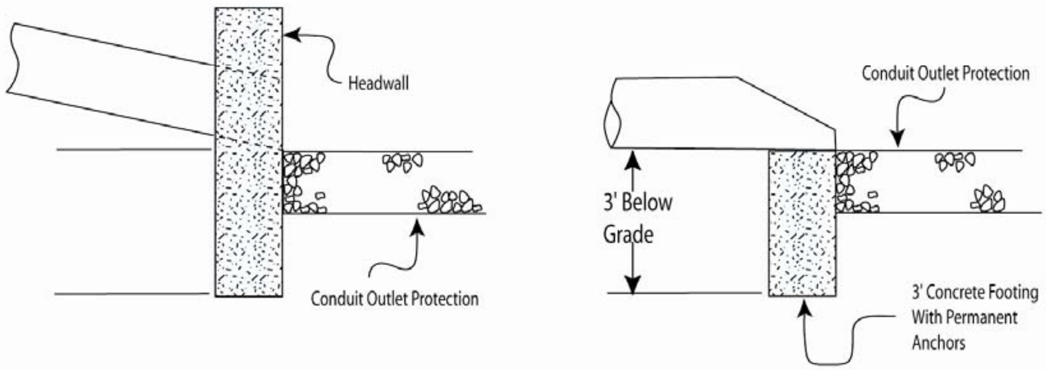
When proposing stormwater discharges, the designer should be aware that no outfall structure or emergency spillway may be oriented toward lands not owned by the applicant. Since this could lead to additional flooding on a neighboring property. As such, this is prohibited unless the applicant can obtain written permission from the affected property owners, per N.J.A.C. 7:13-9.2(f).

It is important to note that if the elevation of the lowest discharge orifice or weir in the basin lies below the flood hazard area design flood elevation, N.J.A.C. 7:13-11.2(c)4 requires that the discharge pipe is equipped with mechanical devices where appropriate to prevent floodwater from backing up the pipe into the basin. This is necessary because, as noted above, floodwaters entering the basin through the discharge pipe can displace volume inside the basin intended to receive and detain stormwater runoff from the site.

2.5.2 Stormwater Outfall Structures

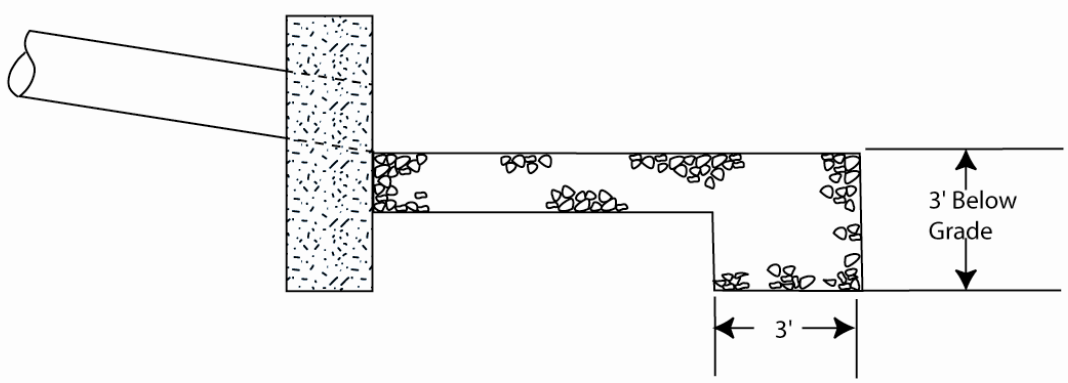
N.J.A.C. 7:13-11.10 details requirements for footings and cutoff walls for outfall structures and associated riprap aprons. Outfall structures must be anchored three feet below grade, whether through a headwall that extends 3 feet below grade or through a flared end section that is permanently anchored to a 3–foot deep concrete footing as shown in Figure 2.8 below:

Figure 2.8
3 - Foot Footing Details



Riprap aprons are required to have a 3 ft by 3 ft cutoff wall at the downstream end of the apron, as shown in Figure 2.9 below:

Figure 2.9
3' X 3' Cutoff Wall Detail



References

New Jersey Department of Transportation, Standard Roadway Construction – Traffic Control – Bridge Construction Details, 2001, Stormwater Outfall Protection, p22, access date: June 5, 2007 (www.state.nj.us/transportation/eng/CADD/E/RoadwayDetails/pdf/eRoadwayDetailsSet.pdf).

New Jersey Department of Transportation, Standard Roadway Construction – Traffic Control – Bridge Construction Details, 2001, End Sections for Concrete Pipe, p22, access date: June 5, 2007 (www.state.nj.us/transportation/eng/CADD/E/RoadwayDetails/pdf/eRoadwayDetailsSet.pdf).

New Jersey State Soil Conservation Committee, Standards for Soil Erosion and Sediment Control Standard for Conduit Outlet Protection, pp 12-1 to 12-7.

Section 3

Flood Storage Displacement

Flood storage displacement (net fill) is addressed in the Flood Hazard Area Control Act rules at N.J.A.C. 7:13-10.4. This section of the manual provides general guidelines and illustrations to clarify the requirements of the rules with regard to how to calculate the volume of fill that may be placed on a site. It also discusses two of the most common methods used in net fill calculations; the average end area method (a.k.a. cross-section method) and the grid method. An example problem is also provided for each method.

3.1 Introduction

A property that lies in a flood hazard area is periodically inundated by floodwaters. Consequently, a certain volume of floodwater will occupy that property during a flood. If a significant volume of floodwater is prevented from occupying a site, the excess floodwater will instead occupy neighboring and downstream properties, thus worsening flood conditions on those sites. Flood storage on a site can be reduced by erecting a structure, which prevents floodwaters from entering a portion of the site, or by raising the ground through the placement of fill material. Since this can adversely impact other properties, the Flood Hazard Area Control Act rules include various restrictions on the volume of floodwater that can be displaced by development.

The previous rules (prior to November 5, 2007) allowed up to 20 percent of the flood storage volume to be displaced on a site in most non-tidal flood hazard areas (referred to as "20-percent net fill"). Within the Central Passaic Basin, all flood storage displacement on a site needed to be compensated for by the creation of equal flood storage elsewhere in the basin, so that there was no overall depletion of flood storage in the basin (referred to as "zero-percent net fill"). The Highlands Water Protection and Planning Act rules also contain a similar provision that prevents development in the Highlands Preservation Area from displacing flood storage.

The current rules further restrict flood storage losses in several ways. First, the zero-percent net fill provision in the Central Passaic Basin and Highlands Preservation Area has been expanded to all non-tidal flood hazard areas Statewide.

As in the Central Passaic Basin and Highlands Preservation Area, a person can displace up to 20 percent of the flood storage on a site, provided an equal volume of flood storage compensation is provided offsite to meet the zero-percent requirement. However, all flood storage compensation must be made in the same flood hazard area and watershed as the proposed fill, and cannot be separated from the proposed fill by a water control structure such as a road or dam (see N.J.A.C. 7:13-10.4(n) and (p) for further details). The rules also require that flood storage calculations be performed for two distinct areas: the area between the flood hazard area design flood and the 10-year flood, and the area between the 10-year flood and the ground. The 20-percent onsite and the zero-percent overall fill limitations must be met for both of these areas.

These changes also affect projects in the Central Passaic Basin, since applicants in that basin can no longer compensate for fill miles away from their site as was previously allowed. An exception is made to allow the use of existing fill-credits that have already been authorized in the Central Passaic Basin. As of the adoption of these rules on November 5, 2007, however, the Department will not accept new applications to create new basin-wide fill-credits.

3.2 General Guidelines

In order to balance the displacement of flood storage resulting from fill and/or construction in the flood fringe, applicants have two options. They can balance fill by creating an equal amount of flood storage onsite, or they can displace up to 20 percent of the flood storage onsite and balance all fill by creating an equal volume of flood storage offsite. It is important to note that the floodway volume should not be counted in the flood storage calculations. Only the volume of the flood fringe should be used to calculate flood storage displacement.

Table D at N.J.A.C. 7:13-10.4(f) (replicated below) sets forth the allowable percentages of flood storage volume that a project can lawfully displace according to three geographic regions of the State. In all cases, as shown in the second column of Table D, the maximum onsite percentage of flood storage volume that a project can lawfully displace is 20 percent of the base flood storage volume onsite. The method for calculating whether a proposed project complies with this requirement is specified at N.J.A.C. 7:13-10.4(g), (h) or (i), depending on the geographic location of the project.

The date for which these calculations are to be made depends on the location of the project. Within the Central Passaic Basin, the base flood storage volume is the volume of the flood fringe that existed onsite on March 25, 1977. The rules reference this date because the Department first began regulating fill within the Central Passaic Basin at that time. Outside the Central Passaic Basin, the base flood storage volume is the volume of the flood fringe that existing onsite on January 31, 1980. The rules reference this date since it is the date the current Flood Hazard Area Control Act was adopted, thus granting the Department the ability to restrict fill in these flood hazard areas.

Table D: ALLOWABLE PERCENTAGES OF FLOOD STORAGE VOLUME DISPLACEMENT (Which shall be met for both the volume between the flood hazard area design flood and the 10-year flood, and the volume between the 10-year flood and the ground)		
Geographic Area	**Maximum onsite percentage of flood storage volume that a project can lawfully displace**	**Maximum total percentage of flood storage volume that a project can lawfully displace including all offsite credits**
Central Passaic Basin	20% of flood storage that existed onsite on March 25, 1977	0% of flood storage that existed onsite on March 25, 1977
Highlands Preservation Area*	20% of flood storage that existed onsite on January 31, 1980	0% of flood storage that existed onsite on August 10, 2004
Remainder of State	20% of flood storage that existed onsite on January 31, 1980	0% of flood storage that existed onsite on November 5, 2007

*If associated with Major Highlands Development, as defined at N.J.A.C. 7:38-1.4.

The third column of Table D indicates the maximum total percentage of flood storage volume that a project can lawfully displace, after all offsite credits are considered. The method for calculating whether a proposed project complies with this requirement is specified at N.J.A.C. 7:13-10.4(l). Offsite credits, which are described at N.J.A.C. 7:13-10.4(o), consist of flood storage that is created offsite to compensate for fill onsite. Overall, a project cannot cause any net loss of flood storage volume. Therefore, all flood storage volume that is displaced onsite must be compensated for in either the manner described at N.J.A.C. 7:13-10.4(m) for onsite compensation or the manner described at N.J.A.C. 7:13-10.4(o) for offsite compensation.

The third column of Table D also lists three dates for calculating the total percentage of flood storage volume that the project can lawfully displace. Within the Central Passaic Basin, the rules reference March 25, 1977, since the Department first began regulating fill within the Central Passaic Basin at that time. Within the Highlands Preservation Area, the zero net fill standard was established by legislation on August 10, 2004, and so this date is used to determine the ultimate flood storage displacement of any Major Highlands Development (as defined at N.J.A.C. 7:38-1.4). Outside the Central Passaic Basin and the Highlands Preservation Area, the rules reference the November 5, 2007, adoption date of these rules, since the Department began to require the zero net fill standard in these areas on that date. This date is also used in the Highlands Preservation Area for any project that is not a Highlands Major Highlands Development.

In order to balance the placement of fill and structures that displace flood storage, an applicant has two options:

1. Balance fill by creating an equal amount of flood storage onsite as described at N.J.A.C. 7:13-10.4(e), or
2. Displace up to 20% of the flood storage onsite and balance all fill by creating an equal volume of flood storage offsite, as described at N.J.A.C. 7:13-10.4(g), (h) and (i).
    - If the regulated activity is located within the Central Passaic Basin, the requirements at N.J.A.C. 7:13-10.4(g) shall be met.
    - If the regulated activity is a Major Highlands Development, as defined at N.J.A.C. 7:38-1.4, the requirements at N.J.A.C. 7:13-10.4(h) shall be met.
    - If the regulated activity is not located within the Central Passaic Basin and is not a Major Highlands Development, the requirements at N.J.A.C. 7:13-10.4(i) below shall be met.

Several examples of how to address the net fill requirements under certain circumstances are outlined below:

1. Balancing fill onsite

Flood storage before work (V_E):	1,000 yd^3
Flood storage after work (V_P):	1,000 yd^3
All cut and fill is balanced onsite:	therefore ok.

2. Central Passaic Basin

Flood storage onsite in 1977 (V_{1977}):	1,000 yd^3
Flood storage onsite after new work (V_P):	950 yd^3
Flood storage displacement:	1,000 yd^3 - 950 yd^3 = 50 yd^3
Percent of 1977 flood storage displacement:	50 yd^3 / 1,000 yd^3 = 5% < 20% therefore ok
Offsite storage that must be created (V_C):	50 yd^3

3. Highlands Preservation Area (no fill placed onsite between 1980 and 2004)

Flood storage onsite in 1980 (V_{1980}):	1,000 yd^3
Flood storage onsite after new work (V_P):	900 yd^3
Flood storage displacement:	1,000 yd^3 - 900 yd^3 = 100 yd^3

Percent of 1980 flood storage displacement:	$100\ yd^3 / 1{,}000\ yd^3$ = 10% < 20% therefore ok
Offsite storage that must be created (V_C):	$100\ yd^3$

4. Highlands Preservation Area (fill placed onsite between 1980 and 2004)

Flood storage onsite in 1980 (V_{1980}):	$1{,}000\ yd^3$
Fill placed onsite between 1980 and 2004:	$100\ yd^3$
Flood storage onsite in 2004 (V_{2004}):	$1{,}000\ yd^3 - 100\ yd^3$ $= 900\ yd^3$

New work will add another $50\ yd^3$ of fill onsite

Flood storage onsite after work (V_P):	$900\ yd^3 - 50\ yd^3$ $= 850\ yd^3$
Final flood storage displacement:	$1{,}000\ yd^3 - 850\ yd^3$ $= 150\ yd^3$
Percent of 1980 flood storage displacement:	$150\ yd^3 / 1{,}000\ yd^3$ = 15% < 20% therefore ok
Offsite storage that must be created (V_C):	$50\ yd^3$

Note: the $100\ yd^3$ of fill placed onsite between 1980 and 2004 does not need to be compensated for offsite, since prior to 2004 applicants were permitted to fill up to 20% of the flood storage volume without offsite compensation.

5. Remainder of State (no fill placed onsite between 1980 and 2007)

Flood storage onsite in 1980 (V_{1980}):	$1{,}000\ yd^3$
Flood storage onsite after new work (V_P):	$875\ yd^3$
Flood storage displacement:	$1{,}000\ yd^3 - 875\ yd^3$ $= 125\ yd^3$
Percent of 1980 flood storage displacement:	$125\ yd^3 / 1{,}000\ yd^3$ = 12.5% < 20% therefore ok
Offsite storage that must be created (V_C):	$125\ yd^3$

6. Remainder of State (fill placed onsite between 1980 and 2007)

Flood storage onsite in 1980 (V_{1980}):	$1{,}000\ yd^3$
Fill placed onsite between 1980 and 2007:	$100\ yd^3$
Flood storage onsite in 2007 (V_{2007}):	$1{,}000\ yd^3 - 100\ yd^3$ $= 900\ yd^3$

New work will add another $75\ yd^3$ of fill onsite

Flood storage onsite after work (V_P):	$900\ yd^3 - 75\ yd^3$ $= 825\ yd^3$
Final flood storage displacement:	$1{,}000\ yd^3 - 825\ yd^3$

	= 175 yd^3
Percent of 1980 flood storage displacement:	175 yd^3 / 1,000 yd^3
	= 17.5%
	< 20% therefore ok
Flood storage needed to be created offsite:	75 yd^3

Note: the 100 yd^3 of fill placed onsite between 1980 and 2007 does not need to be compensated for offsite, since prior to 2007 applicants were permitted to fill up to 20% of the flood storage volume without offsite compensation.

3.3 Effective Flood Storage

Another important factor that must be considered is whether the compensatory flood storage that is intended to be created is *effective*.

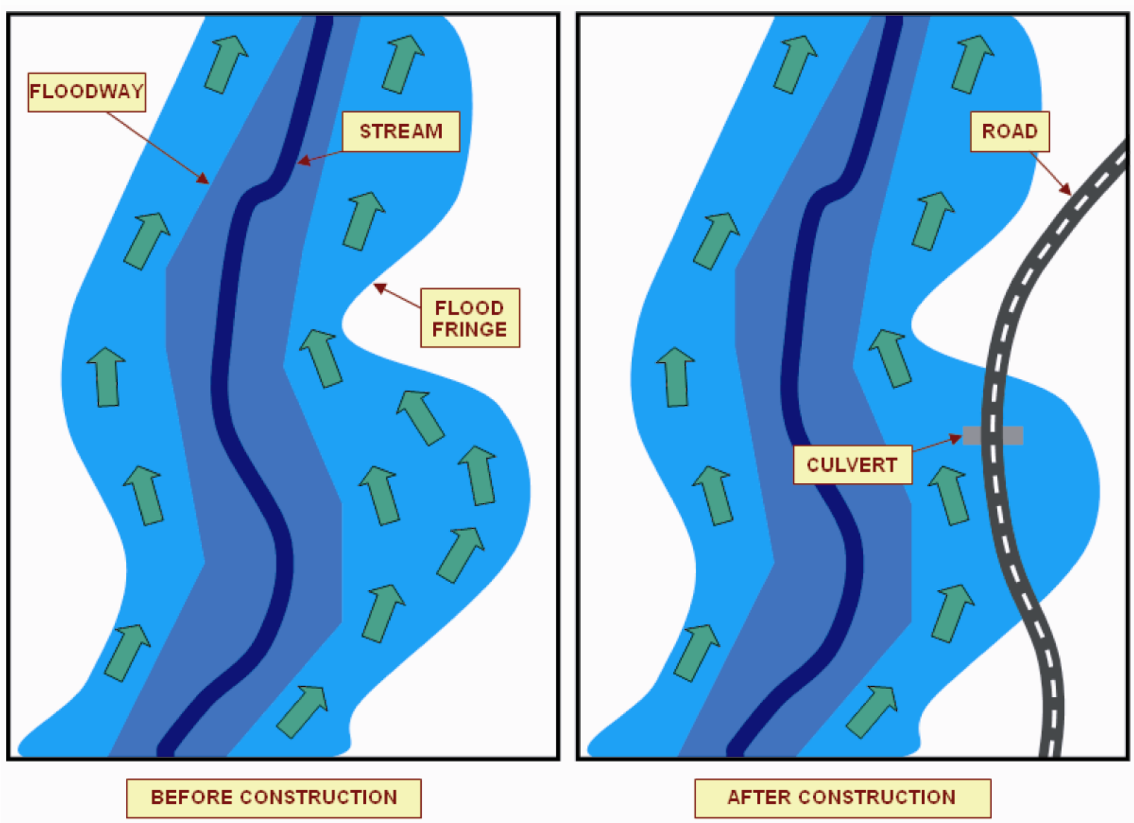
During a flood, floodwaters fill in and occupy certain areas aboveground within the flood hazard area. As noted above, the volume that floodwaters would occupy in the flood fringe on a given site is considered to be the flood storage volume of that site. However, during the course of a flood, floodwaters are continually entering and exiting the site. The true flood storage on a site is therefore not static but is dynamic in proportion to the velocity of the floodwaters.

For example, imagine a bathtub that is full of water. The bathtub contains a certain volume of water due to the shape and size of the bathtub. A site that lies in a flood fringe, however, does not simply fill up with water like a bathtub at the beginning of a flood and then release water when the flood is over. Water is continually entering and exiting the site. So, a better model for a site within a flood fringe would be a bathtub with the faucet on and the drain open at the same time. Water is continually entering the tub and exiting the tub. So, while the actual volume of the bathtub is static, the total volume of water passing through the bathtub could be many times its volume if the faucet is left on for a period of time.

Because of the above, it is important that any flood storage volume being created is *effective*, meaning that floodwaters can freely enter and exit the area being created. As such, an applicant cannot take credit for created areas that will simply fill up with floodwaters and remain full during the course of the flood. For example, applicants sometimes propose to create belowground chambers connected to the flood fringe by pipes, which fill up with floodwaters and remain full until the flood recedes. Such an area is not effective flood storage, since there is no free exchange of floodwaters during the course of the flood. Applicants also sometimes propose to create isolated depressions or other similar aboveground areas on the edge of a flood fringe, which are connected to the flood hazard area via pipes. While it is true that floodways can enter and fill up these areas, there is no free exchange of floodwaters during a flood, and so these areas are not effective.

For example, refer to Figure 3.1 below, which illustrates a flood hazard area before and after the construction of a road. Prior to construction, floodwaters (represented by the green arrows) are able to freely pass through the entire flood fringe area. The construction of the road, however, truncates a portion of the flood fringe so that floodwaters cannot freely enter and exit the area to the right of the road during the course of the flood. The culvert does allow floodwaters to fill up the area to the right of the road. However, once this area is filled, the area becomes ineffective to further in-flow and therefore does not contribute to the effect flood storage volume of the flood fringe. However, if the road were constructed on pilings (such as a causeway) or with many culverts (so that floodwaters could freely move from one side of the road to the other) the area to the right of the road may be considered to be effective flood storage.

Figure 3.1



Finally, it is again important to note that the floodway volume should not be counted in the flood storage calculations. Only the volume of the flood fringe should be utilized.

3.4 Storage for 10-Year and Flood Hazard Area Design Floods

In order to better protect the public from increases in the frequency and intensity of smaller flood events as well as large flood events, the Flood Hazard Area Control Act Rules require that the 0% and 20% net fill requirements be met for both the 10-year flood and the flood hazard area design flood. Specifically, requirements apply to the flood storage volume displaced between the flood hazard area design flood elevation and the 10-year flood and also to the volume flood storage volume displaced between the 10-year flood elevation and the ground (see N.J.A.C. 7:13-10.4(c)). The previous rules required only that the net fill standards be met for the flood hazard area design flood. However, site grading is sometimes accomplished in such a way that a large volume of flood storage is displaced during smaller flood events, while the overall site still meets the net fill standards for the flood hazard area design flood. This could result in increased flooding in smaller events such as the 10-year flood. In other cases, applicants have proposed to eliminate significant flood storage above the 10-year flood elevation and then provide excavation at locations where the ground elevation is very low. While excavation in these areas would provide storage for smaller storms such as the 10-year flood, the storage volume would already be occupied when the flood hazard area design flood eventually reached the project site, which could result in increased flooding. The standards of the rules are intended to ensure that flood storage is preserved for small floods and large floods alike.

Figure 3.2

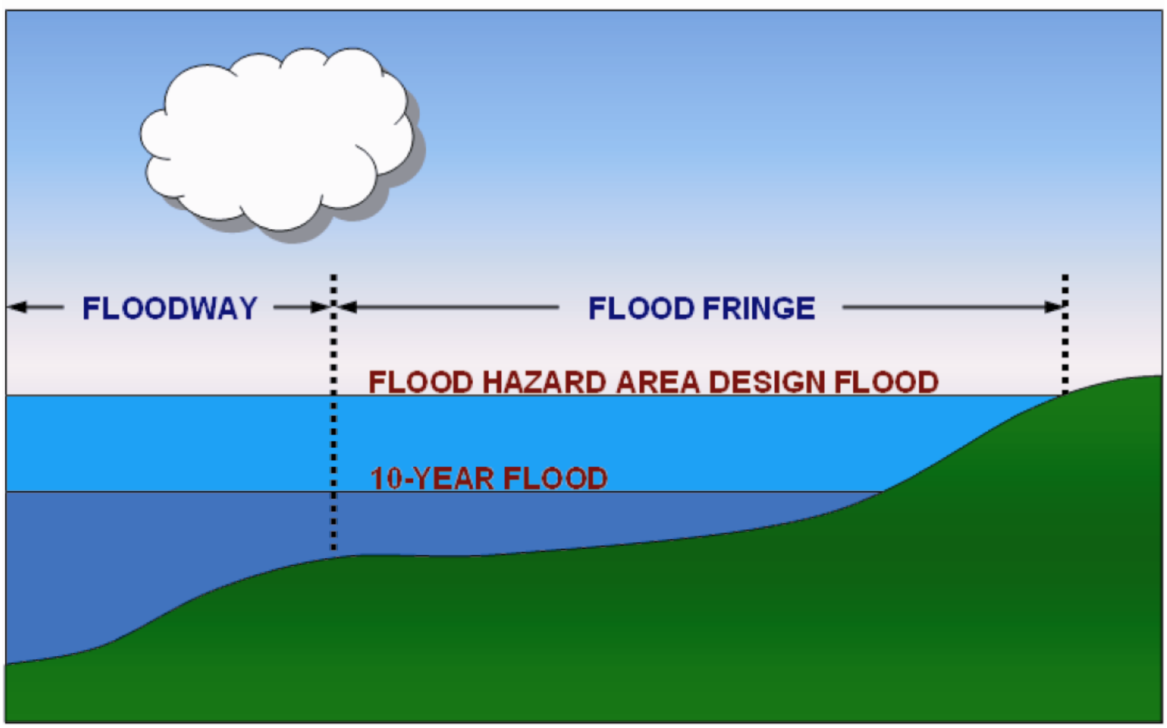


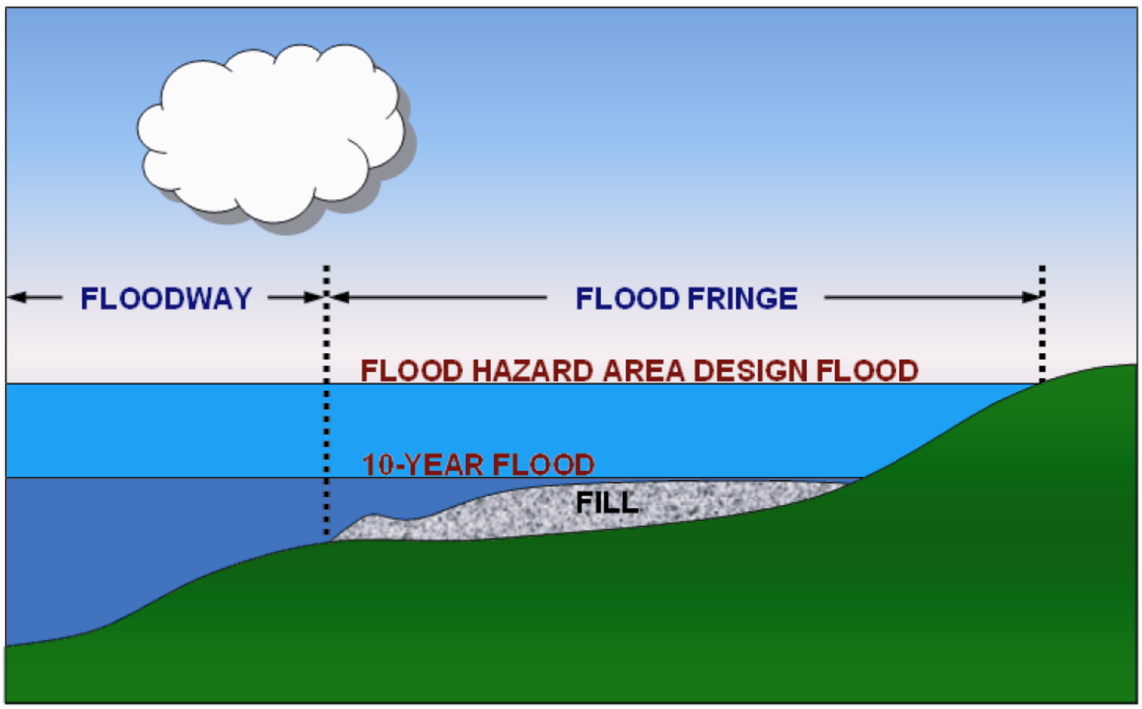
Figure 3.2 above illustrates the how the net fill requirements apply to both:

- o The flood storage volume displaced between the flood hazard area design flood elevation and the 10-year flood elevation (the lighter blue area), and
- o The flood storage volume displaced between the 10-year flood elevation and

the ground (the darker blue area).

Figure 3.3 below illustrates a situation where there is no lost flood storage volume between flood hazard area design flood and 10-year flood, but there is considerably more than 20% flood storage displacement between the 10-year flood and the ground. In this case, even if the applicant balanced all of the fill with offsite excavation at appropriate elevations, the application could not be approved because it does not satisfy the onsite 20% requirement between the 10-year flood and the ground.

Figure 3.3



In cases where the 10-year flood elevation is not provided on State or FEMA flood maps, the applicant may either calculate the 10-year flood elevation using hydrologic and hydraulic calculations, or the applicant may approximate the 10-year flood elevation in accordance with N.J.A.C. 7:13-10.4(j)3. For this purpose, the approximate 10-year flood elevation is halfway between the flood hazard area design flood elevation and the lowest ground elevation within the flood fringe onsite, at each given cross section.

For example, at a particular cross-section, if the flood hazard area design flood elevation is 90.0 ft NGVD and the lowest ground elevation of effective flow area within the flood fringe is 80.0 ft NGVD, the approximate 10-year flood elevation would be 85.0 ft NGVD. Figures 3.4 and 3.5 below illustrate how to approximate the 10-year flood elevation as described above. (Please note that the lowest point in the flood fringe at a particular cross-section may not necessarily be located at the floodway limit.)

Figure 3.4

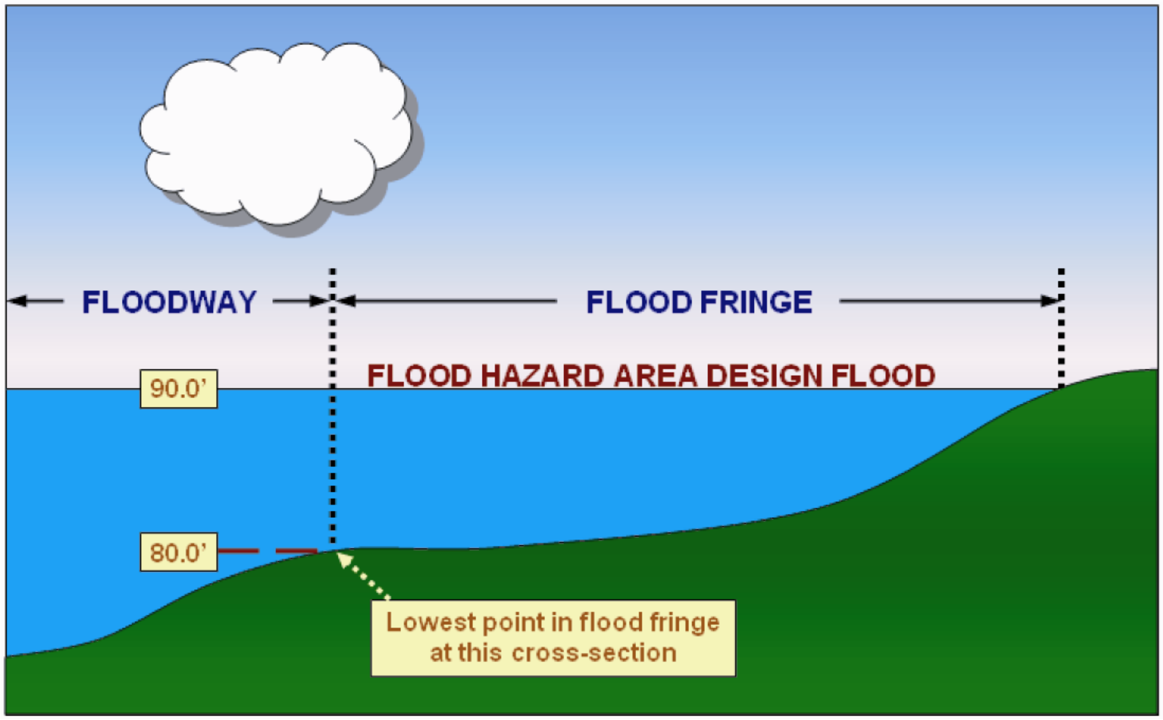
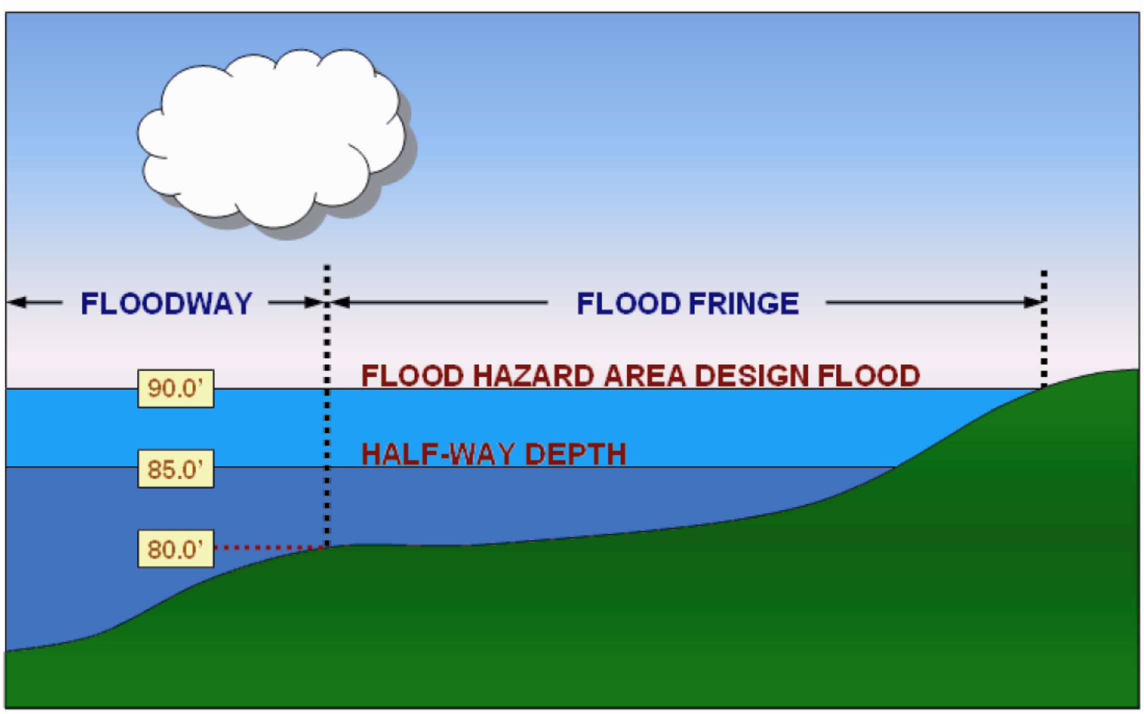


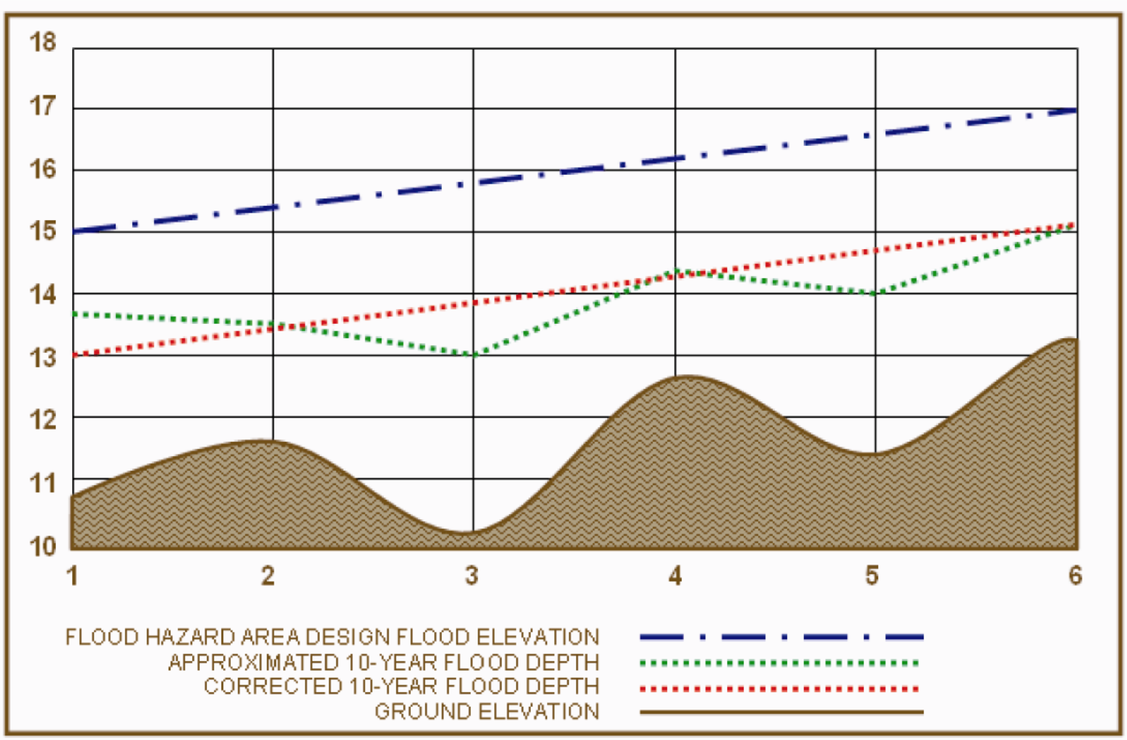
Figure 3.5



This halfway depth must be determined separately for each cross-section in the flood fringe, and at close intervals throughout the site in order to provide an accurate estimate of the upper and lower flood storage volumes. Furthermore, since this method only provides an approximation of the 10-year flood elevation, it may lead to inconsistencies in certain situations. Therefore, the applicant should take into consideration the following when using this method, as presented in the examples below:

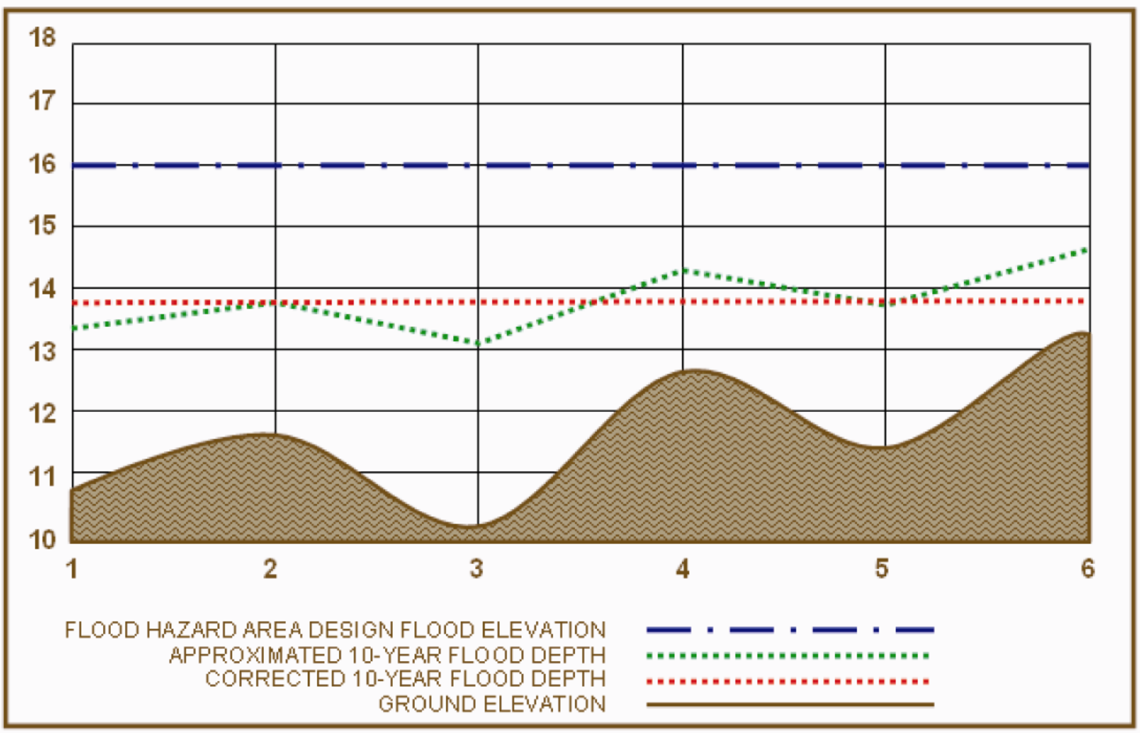
Example 1: The lowest ground elevation in the flood fringe will likely vary from cross-section to cross-section. Furthermore, the lowest ground elevation may not necessarily rise in a consistent manner moving from the downstream to the upstream end of the project site. For example, the lowest ground elevations for cross-sections 1 through 6, respectively, may be 10.8, 11.6, 10.2, 12.6, 11.4 and 13.2 while the corresponding flood hazard area design flood elevations may be 15.0, 15.4, 15.8, 16.2, 16.6 and 17.0. Using the method described above, the half-way depth would be 13.7, 13.5, 13.0, 14.4, 14.0 and 15.1. Obviously under normal flow conditions one would expect the 10-year flood to rise consistently going upstream. Therefore, an applicant may choose to adjust the half-way depth to better reflect actual conditions. One way to do this may be to apply the lowest elevation to cross-section 1 and the highest elevation to cross-section 6 and then interpolate the elevations for the other cross-sections which would yield half-way depth elevations of 13.0, 13.4, 13.8, 14.2, 14.6 and 15.1. (See Figure 3.6 below.)

Figure 3.6



Example 2: Using the same ground elevations from Example 1, but assuming a level flood hazard area design flood elevation of 16.0 throughout the site, the half-way depth elevations would be 13.4, 13.8, 13.1, 14.3, 13.7 and 14.6. Again, under normal flow conditions, one would expect that the 10-year flood elevations would rise going upstream. Since the flood hazard area design flood elevation is flat through this site, it may therefore be more appropriate to average the half-way elevations and use a constant elevation of 13.8 through the project site. However, the adjustment outlined in Example 1 above may be more appropriate if a downstream control structure (such as a bridge or culvert) is causing the flat flood hazard area design flood elevation, and it does not appear that the control structure would create a similar situation during a 10-year flood. (See Figure 3.7 below.)

Figure 3.7



Note: The rationale for any adjustments made to the approximate 10-year flood, as outlined above or otherwise, should be clearly explained in the application's engineering report so that Department staff can understand and evaluate the methods being used.

3.5 Methods for Calculating Flood Storage

The two most common methods for calculating flood storage for the purpose of demonstrating compliance with the 20% and 0% net fill limits are the Average End Area Method (Cross-section Method) and the Grid Method. Some applicants utilize a computer program that can accurately calculate existing and proposed flood storage volumes from topographic plans, cross-sections and/or grids with the only output being the storage volume itself. Even though the method may be accurate, the Department may not be able to verify that the input entered into the program to generate the submitted results is correct. As such the Department cannot verify the results. Consequently, regardless of the method chosen by the applicant, all supporting calculations must be able to be verified by the Department.

The **Average End Area Method** involves:

- Creating a number of cross-sections throughout a site.
- Calculating the area of each cross-section (in the flood fringe) between the flood hazard area design flood elevation and the 10-year flood (the “upper” slice of the flood fringe), and between the 10-year flood and the ground (the “lower” slice of the flood fringe).
- Finding the average area of each adjacent cross-section (the average area of cross-sections 1 and 2, the average area of cross-sections 2 and 3, and so on) for both the “upper” and “lower” slices of the flood fringe as described above.
- Multiplying each average area by the distance between the two adjoining cross-sections in order to determine the flood storage volume between the two cross-sections for both slices.
- Summing the flood storage volume between each pair of adjacent cross-sections to yield the total volume of the flood fringe onsite for both slices.

A number of considerations that should be made to ensure accurate results are as follows:

1. If the floodway is located on the project site, the floodway line must be shown on each cross-section that intersects the floodway. It is important to note that since the flood storage displacement limits only apply to the flood fringe, the area of the cross-section within the floodway should not be included in the area of the cross-section.
2. Cross-sections used for the calculations must be parallel to each other so that there is a constant distance between any two cross-sections. Cross-sections used for hydraulic modeling of a stream are generally not parallel and therefore cannot typically be used for flood storage calculations.
3. In many cases, flood elevations will vary through a project site and thus the applicant must be careful to vary the flood elevation accordingly at each cross-section to match the flood elevation at that location.
4. Cross-sections must be carefully selected in order to accurately calculate flood storage volumes. For instance, cross-sections should not necessarily be chosen at regular intervals if doing so will miss significant depressions or high areas on the site. Also, it may be necessary to add cross-sections to accurately reflect loss of storage associated with buildings. It is particularly important to locate a cross-section at the face of the building wall and then calculate two separate areas: one

looking away from the building to calculate the area just outside the building wall and one looking into the building to calculate the area just inside the building wall (see Average End Area Method Example Problem).

5. In some cases, it may be more accurate to have a separate calculation for certain structures for which the flood storage volume is not easily calculated or may be missed altogether by the Average End Area Method. For example, if an applicant constructs a crawl space with a floor elevation below the flood elevation, floodwaters can enter the crawl space through the required flood vents. The area within the enclosed crawl space will therefore still provide flood storage. However, the foundation walls and any interior walls and columns within the crawl space must be accounted for and may best be handled by separate calculations. Other items that might need special consideration include, but are not limited to, small decks and porches, raised gardens, and material or equipment that will be stored in the flood hazard area.

Under the **Grid Method**, a grid is superimposed over a grading plan effectively dividing the site into a series of cells, which will be comprised of squares and other polygons. In the case of squares and rectangles, the spot elevations of the four corners are averaged and the average elevation is subtracted from the flood elevation to achieve an average depth of floodwaters within the cell. This depth is then multiplied by the area of the cell to determine the volume of the floodwaters in that cell (see discussion below for other geometric shapes). The process is then continued until the volume has been determined for each cell of the grid at which point the volumes are summed to determine the total volume of the flood storage volume on the project site. A number of considerations that should be made to ensure accurate results are as follows:

1. If the floodway is located on the project site, the floodway line must be shown on the grading plan which has the grid superimposed on it. Again, it is important to note that since the flood storage displacement limits only apply to the flood fringe, portions of the grid that are located within the floodway cannot be included in the calculations.
2. In many cases, flood elevations will vary through a project site and thus the applicant must be careful to vary the flood elevation accordingly at each cell to match the flood elevation at that location.
3. Generally, the cells in a grid consist of squares or rectangles. However, this is not always the case. When the grid interfaces with a property line, floodway line, flood elevation line, or an irregularly-shaped structure or other feature, the cell at that interface will not be a square or rectangle. For instance a property line, floodway line, etc., may cut across a grid at an angle and form a trapezoid or triangle at the interface. If the interface is curvilinear then the cell will have an irregular shape. It is important to note that if the cell is a trapezoid, averaging the four corners of the trapezoid may not yield an accurate ground elevation for the trapezoid. Furthermore, in the case of a triangle or irregular geometric shapes there may not be four corners to average. In any of these cases it is important to look at the topography throughout the cell and then use engineering judgment to estimate the average ground elevation within that cell.

4. Similar to the discussion above, when the ground slope changes abruptly or the contour lines are otherwise irregular within a rectangular area, averaging the four corners may not yield an accurate ground elevation. In some cases, this problem can be rectified by breaking the cell into smaller cells. This would be the case when the ground slope changes abruptly within the cell. The cell could be divided in two, one portion for the steeper part and one portion for the flatter part. In the case of more irregular topography, engineering judgment should be used to estimate the average ground elevation within the cell.
5. As noted above, irregular topography can make it difficult to determine the average ground elevation within a cell. For this reason, it is very important to select a grid size that will provide an adequate level of accuracy. For most sites, 25-ft by 25-ft squares provide a sufficient level of accuracy. A site with irregular topography may require smaller grids to provide accurate flood storage calculations. However, if a site is very flat, somewhat larger cells can be used with little or no impact on accuracy.
6. In some cases, it may be more accurate to have a separate calculation for certain structures that are not easily calculated or may be missed altogether by the Grid Method. For example, if an applicant constructs a crawl space with a floor elevation below the flood elevation, floodwaters can enter the crawl space through the required flood vents. The area within the enclosed crawl space will therefore still provide flood storage. However, the foundation walls and any interior walls and columns within the crawl space must be accounted for and may best be handled by a separate calculations. Other items that might need special consideration include, but are not limited to, small decks and porches, raised gardens, and material or equipment that will be stored in the flood hazard area

3.6 Example Problems

The site plan shown in Figure 3.8 below, which is the same for both example problems, involves the construction of two single-family dwellings on a property that is partially located within the flood hazard area and within the 10-year flood plain. The entire property lies outside of the floodway and therefore the floodway boundary is not shown on the site plan. The flood hazard area design flood for the site is 23.5 ft NGVD and the 10-year flood elevation for the site is 21.5 ft NGVD.

It is important to note that the proposed grading and design of the dwellings would require revisions in order to satisfy the requirements of the Flood Hazard Area Control Act Rules. The garage elevations would have to be raised to 24.5 ft NGVD to satisfy N.J.A.C. 7:13-11.5(k) which requires the lowest floor to be constructed at least one foot above the flood hazard area design flood elevation. Also, as can be seen in the example problems that follow, the project site will have to be regraded in order to satisfy the flood storage displacement requirements for both the flood hazard area design and 10-year floods.

Note: The grading plan and building designs shown in Figure 3.8 were created solely to illustrate flood storage calculations for these example problems and may not otherwise represent sound engineering judgment.

Some additional details regarding the grading plan are as follows:

1. The dwellings each have a crawl space adjacent to and behind the garage. The crawl spaces both have flood vents, which are flush with the floor elevation of the crawl space. The westerly dwelling has a crawl space elevation of 22.3 ft NGVD which is above the 10-year flood elevation but below the flood hazard area design flood elevation. Therefore, that crawl space will provide flood storage for the flood hazard area design flood but not the 10-year flood. However, the easterly dwelling has a crawl space elevation of 21.1 ft NGVD and therefore it will provide storage for both the 10-year and flood hazard area design floods. It is important to note that if the flood vents on the easterly dwelling were placed one foot above the elevation of the crawl space, the crawl space would no longer allow the 10-year flood to enter and thus there would be no storage for the 10-year flood for that crawl space either.
2. The foundation walls of both dwellings are assumed to be 8 inches thick. The flood storage displacement from these walls has been calculated separately. Since the first floors of the dwellings are 1 ft above the flood elevation, it is assumed that the beams and support joists displace no floodwaters.
3. In order to eliminate the need to fill the front yards, each driveway has a 1-ft wide retaining wall which matches the driveway elevation (the top of the wall is flush with the driveway elevation and the bottom of the wall matches the existing grade). Some minor adjustments were made to the calculations to account for these walls.
4. In order to fit the format of this manual, the size of the site plan has been reduced from the indicated scale of 1" = 20'. In order to determine the actual scale of the reduced version, please reference the site plan's bar scale which has been reduced along with the rest of the drawing. For the ease of calculations, cross-sections are generally spaced 20 ft apart and the cells of the grids are generally 20 ft by 20 ft for the average end area and grid methods, respectively.

Average End Area Method Example

For the average end area method a series of 11 cross-sections were taken through the property beginning with cross-section 1 on the westerly property line and ending with cross-section 11 on the easterly property line. (See cross-sections below). Many of the cross-sections are located at an interface as outlined above and therefore these sections will be different depending on whether they are looking west or east. For instance, cross-section 2W is located just outside of the building and cross-section 2E is located just inside of the building. The average area and volumes for each cross-section were calculated for both existing and proposed conditions. This information is reflected in Tables 3.1 and 3.2 for the 10-year and flood hazard area design floods, respectively.

For the 10-year flood the total existing flood storage is 10,437 ft^3 while the proposed flood storage is 9,697 ft^3. This represents a flood storage displacement (net fill) of 740 ft^3 or 7.1% of the 10-year flood storage volume. For the flood hazard area design flood the total existing flood storage is 39,800 ft^3 while the proposed flood storage is 36,511 ft^3. The project as proposed clearly satisfies the onsite 20% net fill requirements of N.J.A.C. 7:13-10.4 for the 10-year flood. However, the rules also require that the regulated activity will displace no more than 20% of the storage volume between the flood hazard design flood and the 10-year flood. The existing flood storage in this zone would be (39,800 ft^3 - 10,437 ft^3) = 29,363 ft^3 and the proposed flood storage in this zone would be (36,511 ft^3 - 9,697 ft^3) = 26,814 ft^3. This represents a flood storage displacement in this zone of 2,549 ft^3 or 8.7%. Therefore the project as designed would satisfy the 20% net fill requirements for both the 10-year flood and the volume between the 10-year and flood hazard design floods.

However, since there is net fill proposed in both zones, as previously noted, the applicant would either have to redesign the project to balance cut and fill onsite or provide offsite compensation for the excess fill in order to satisfy the 0% net fill provisions of N.J.A.C. 7:13-10.4.

Grid Method Example

As indicated above, the project site has generally been divided up into a grid comprised of 20 ft by 20 ft cells. The vertical axis for the grid is represented by the letters A through G and the horizontal axis of the grid is represented by the numbers 1 through 10. For the proposed conditions, depending on whether the 10-year flood or the flood hazard area design flood is being calculated, cells E2, E3, E4, E7, E8 and E9 may have been divided in half to form proposed 10 ft by 20 ft cells. This was necessary to account for the fact that half of the cells are located within the footprint of the dwelling and half are outside of the dwelling. These half cells are labeled as “E” and “EE”, respectively (see Figure 3.8 below).

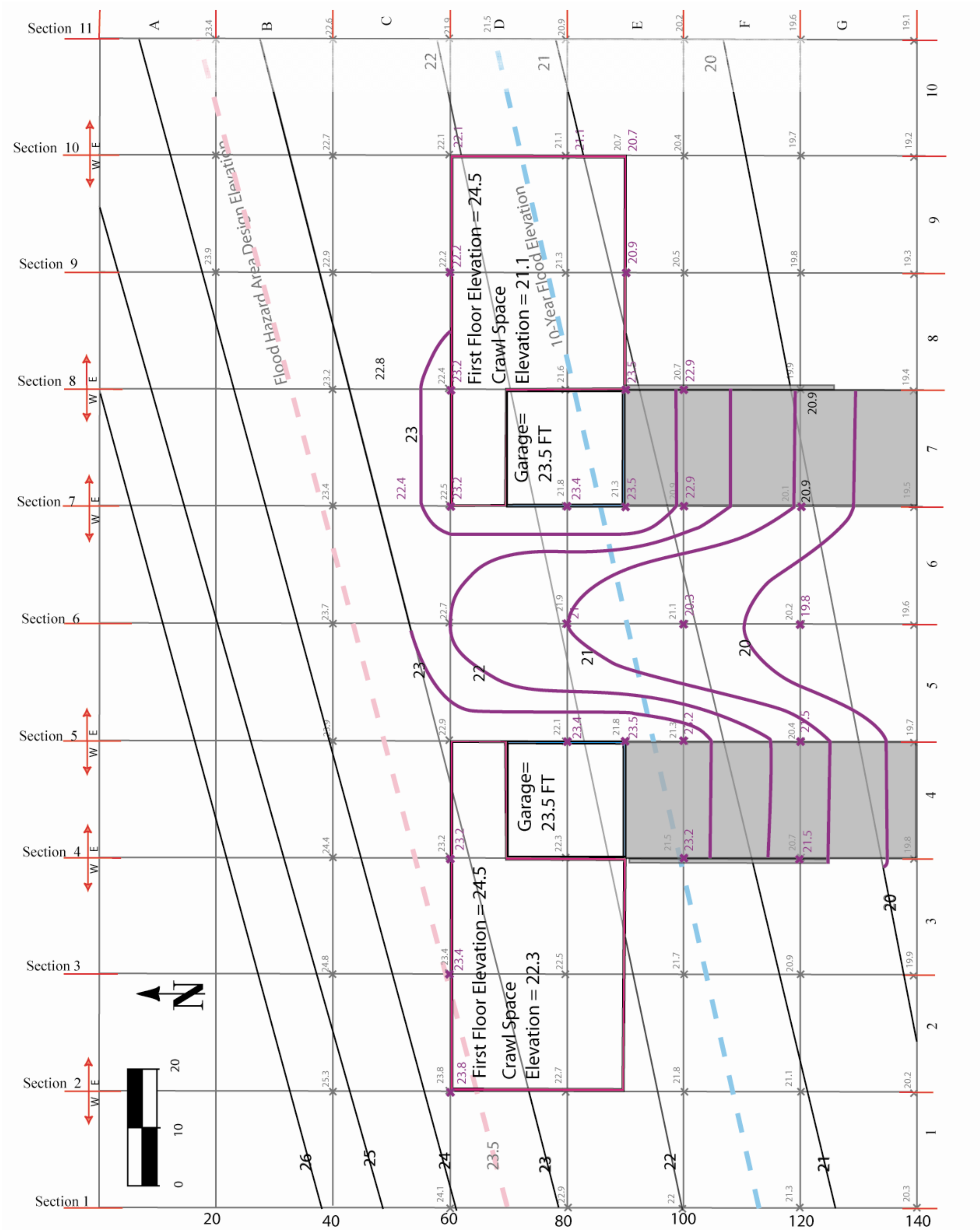
Existing and proposed spot elevations are generally noted at the corner of each grid except that proposed spots are not noted where there is no proposed grading and no spot elevations are noted for areas located outside of the flood hazard area. As indicated above, the spot elevations for existing and proposed conditions have been averaged for the four corners of the rectangular cells and have been determined by inspection for triangular and trapezoidal areas or for areas where grading is irregular. The average elevation, average flood depth, area and volume for each cell were then calculated for both existing and proposed conditions. This information is reflected in Tables 3.3 and 3.4 for the 10-year and flood hazard area design floods, respectively.

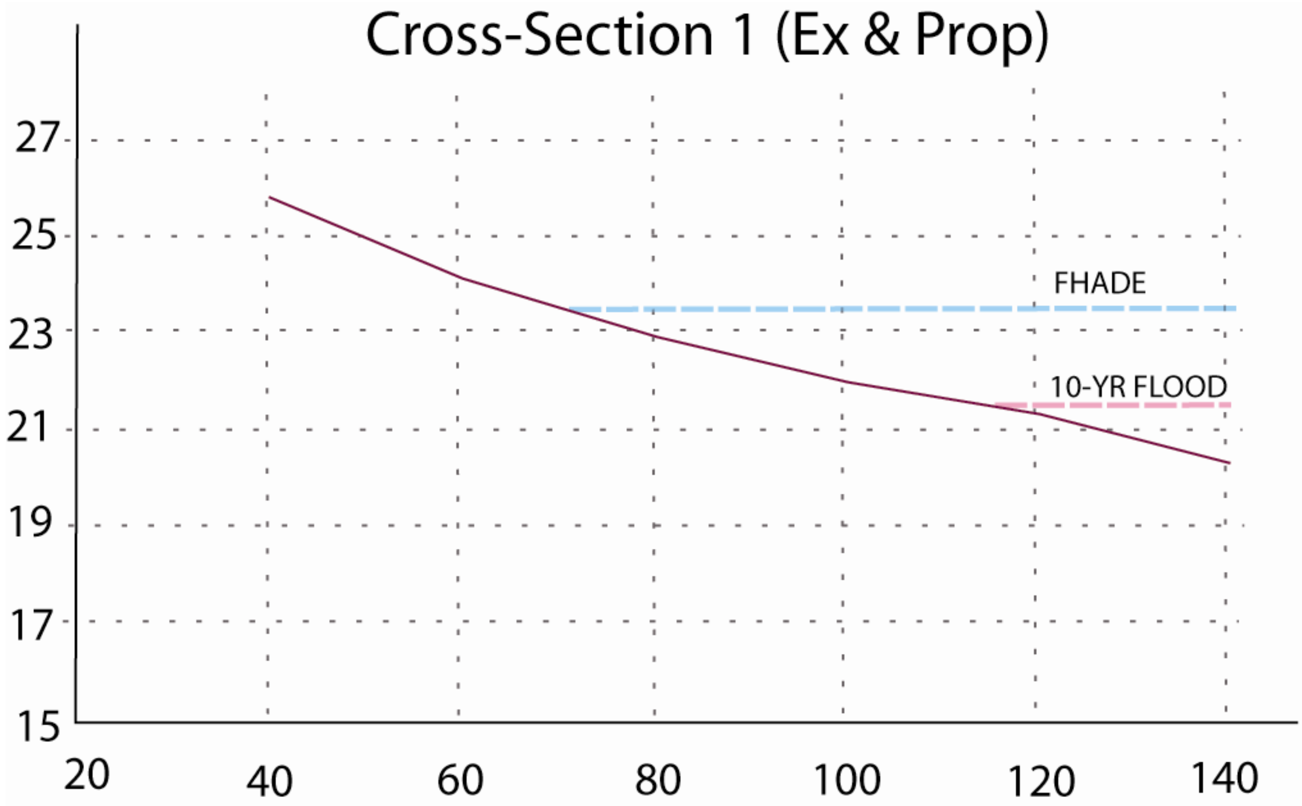
For the 10-year flood, the total existing flood storage is 10,434 ft^3 while the proposed flood storage is 9,770 ft^3. This represents a net fill of 664 ft^3 or 6.4%. For the flood hazard area design flood the total existing flood storage is 39,637 ft^3 while the proposed flood storage is 36,693 ft^3. The project as proposed clearly satisfies the onsite 20% net fill requirements of N.J.A.C. 7:13-10.4 for the 10-year flood. However, the rules also require that the regulated activity displace no more than 20% of the storage volume between the flood hazard design flood and the 10-year flood. The existing flood storage in this zone would be (39,637 ft^3 - 10,434 ft^3) = 29,203 ft^3, while the proposed flood storage in this zone would be (36,693 ft^3 - 9,770 ft^3) = 26,923 ft^3. This would represent a flood storage displacement in this zone of 2,280 ft^3 or 7.8%. Therefore the project as designed would satisfy the 20% net fill requirements for both the 10-year flood and the volume between the 10-year and flood hazard design floods.

However, since there is net fill proposed in both zones, the applicant would either have to redesign the project to balance cut and fill onsite or provide offsite compensation for the excess fill in order to satisfy the no net fill provisions of N.J.A.C. 7:13-10.4.

Note: Even though the same grading plan was used for both examples, the calculated flood storage volumes and proposed fill volumes are slightly different. This is not unusual, since both methods are simply approximations of the actual flood storage volumes onsite.

Figure 3.8: Grid and Cross-Section Locations




Cross-Section 1 (Ex & Prop)
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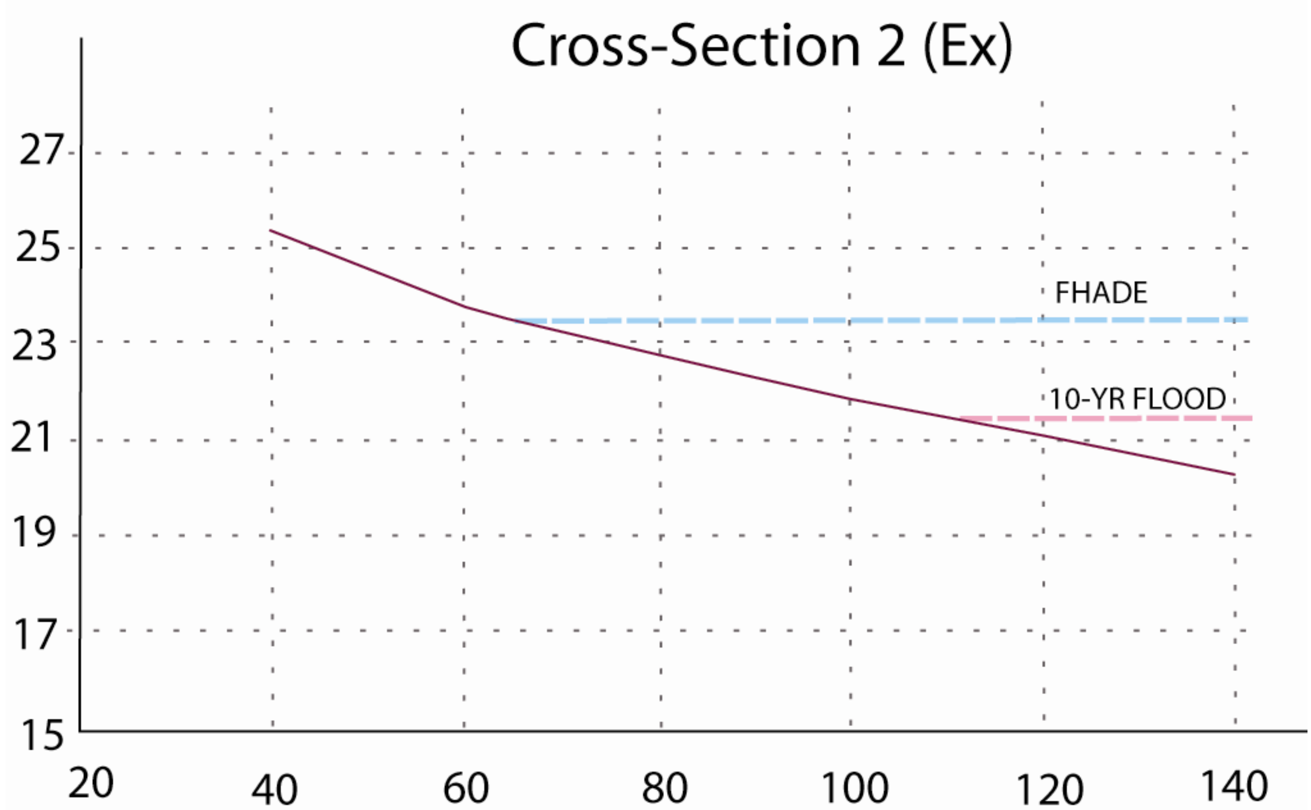
FHADE
10-YR FLOOD


Cross-Section 2 (Ex)
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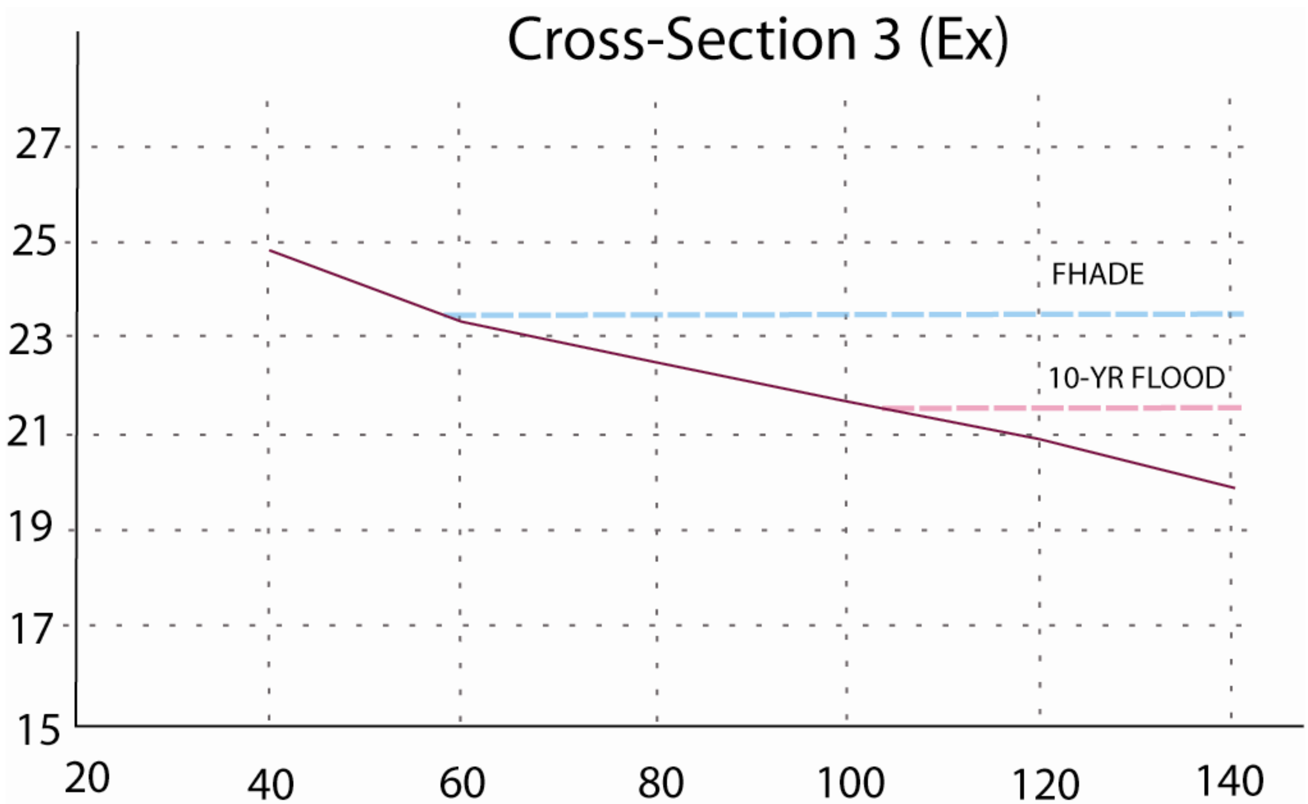
10-YR FLOOD


Cross-Section 3 (Ex)
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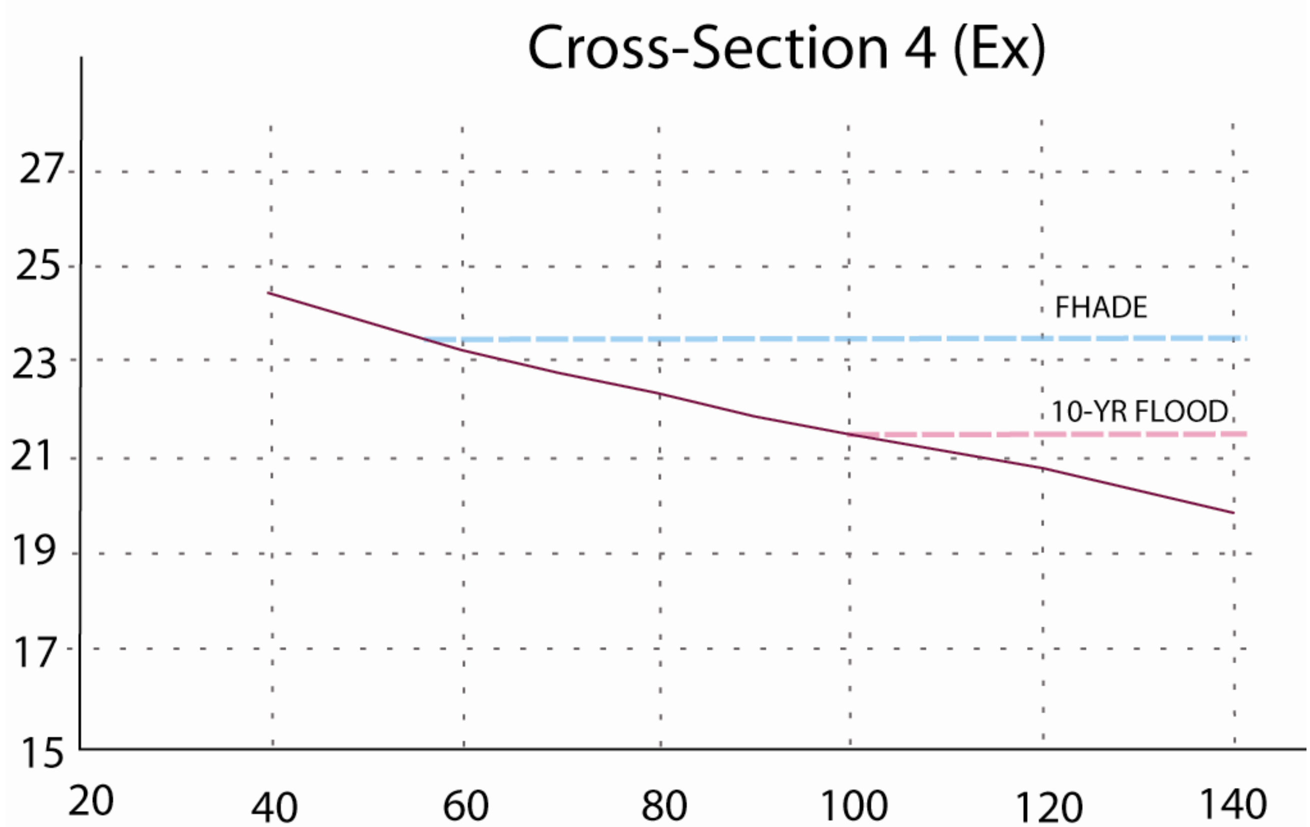
FHADE
10-YR FLOOD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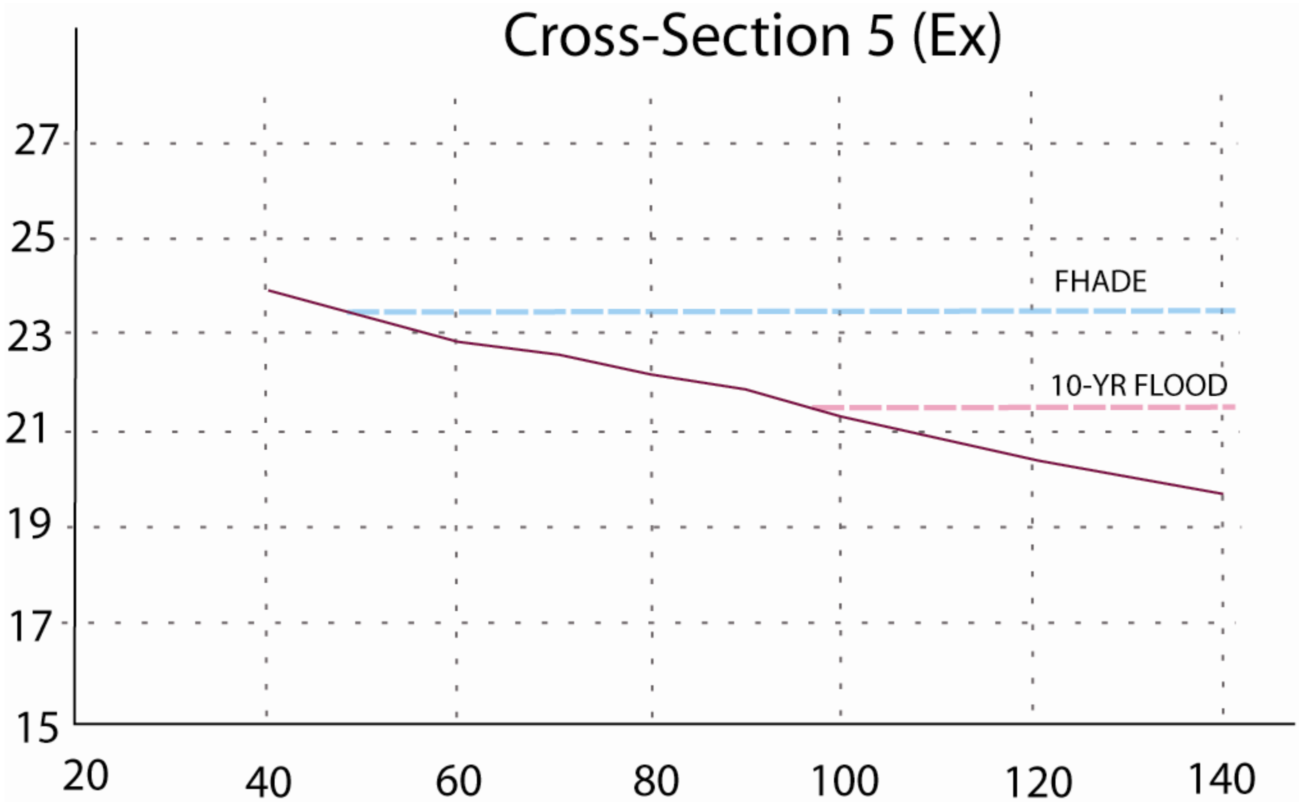
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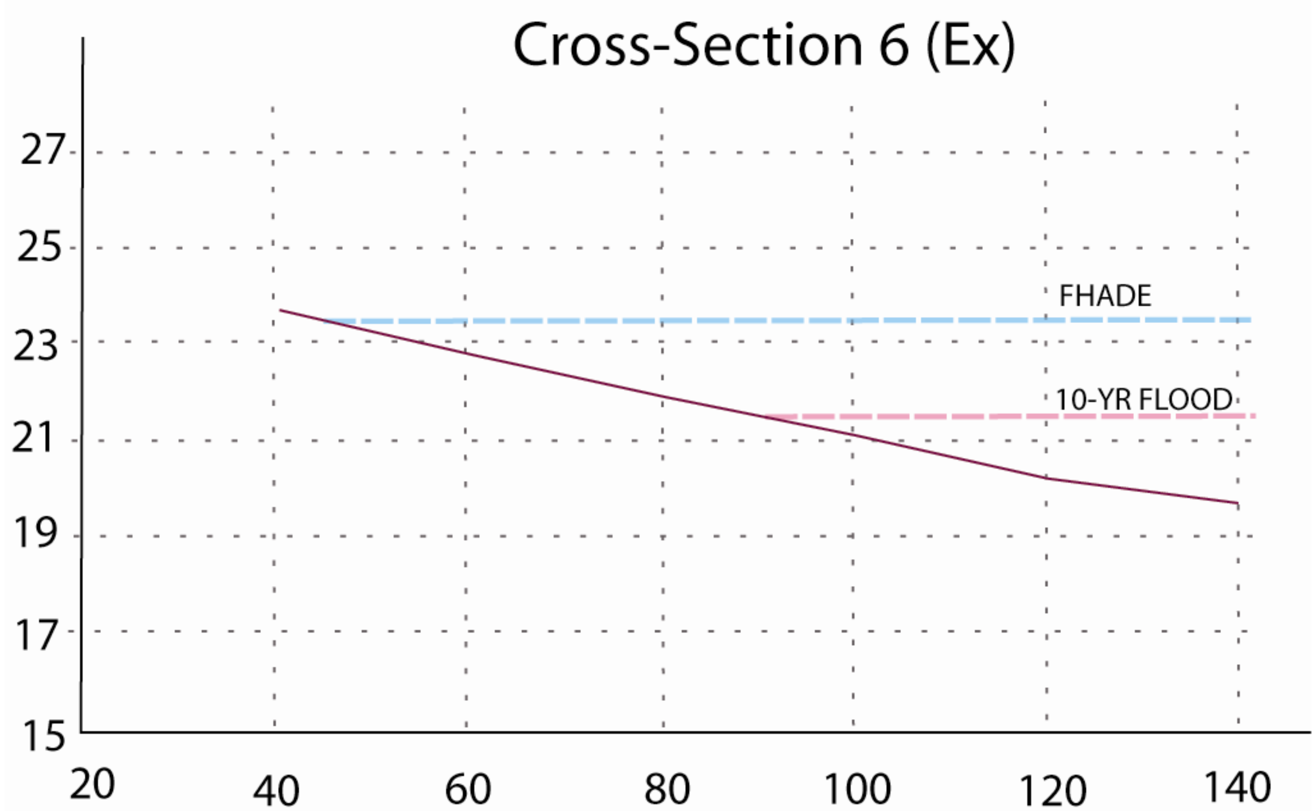
Cross-Section 6 (Ex)
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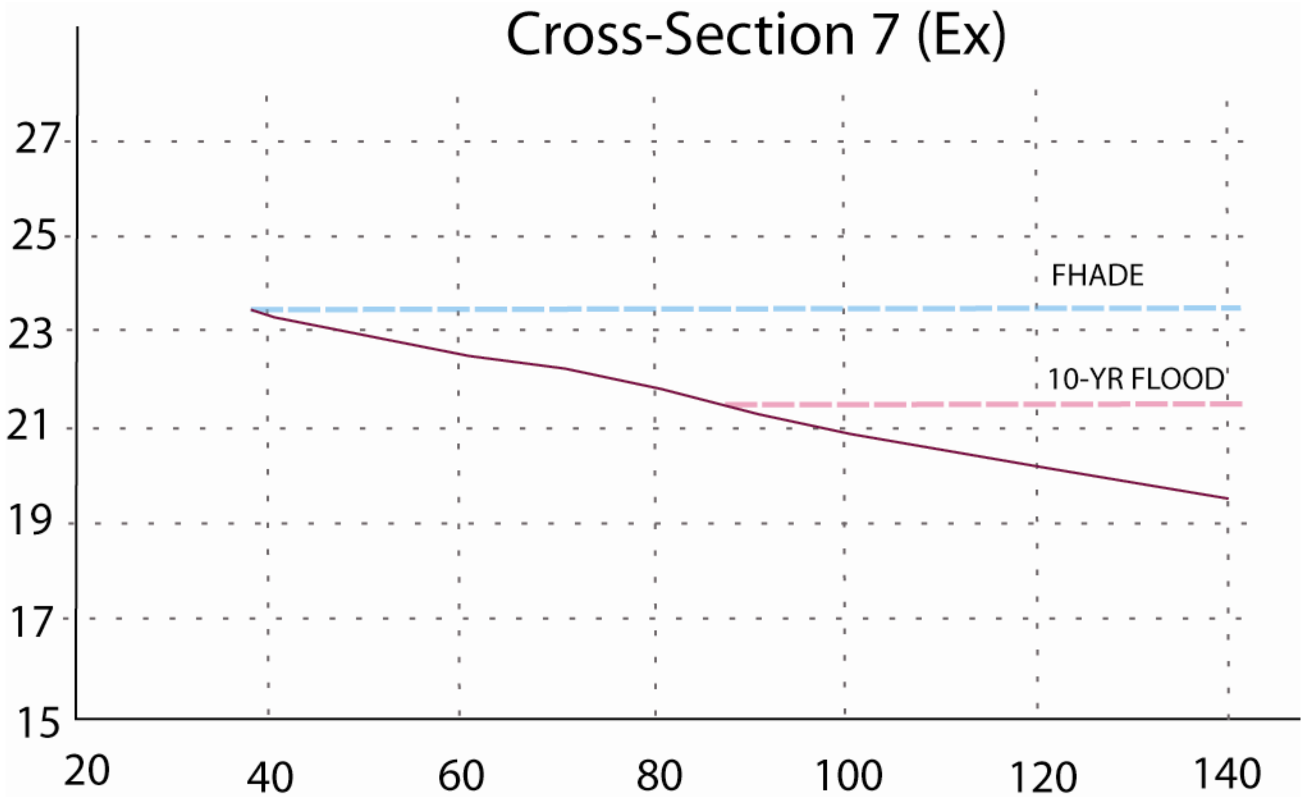
FHADE
10-YR FLOOD


Cross-Section 7 (Ex)
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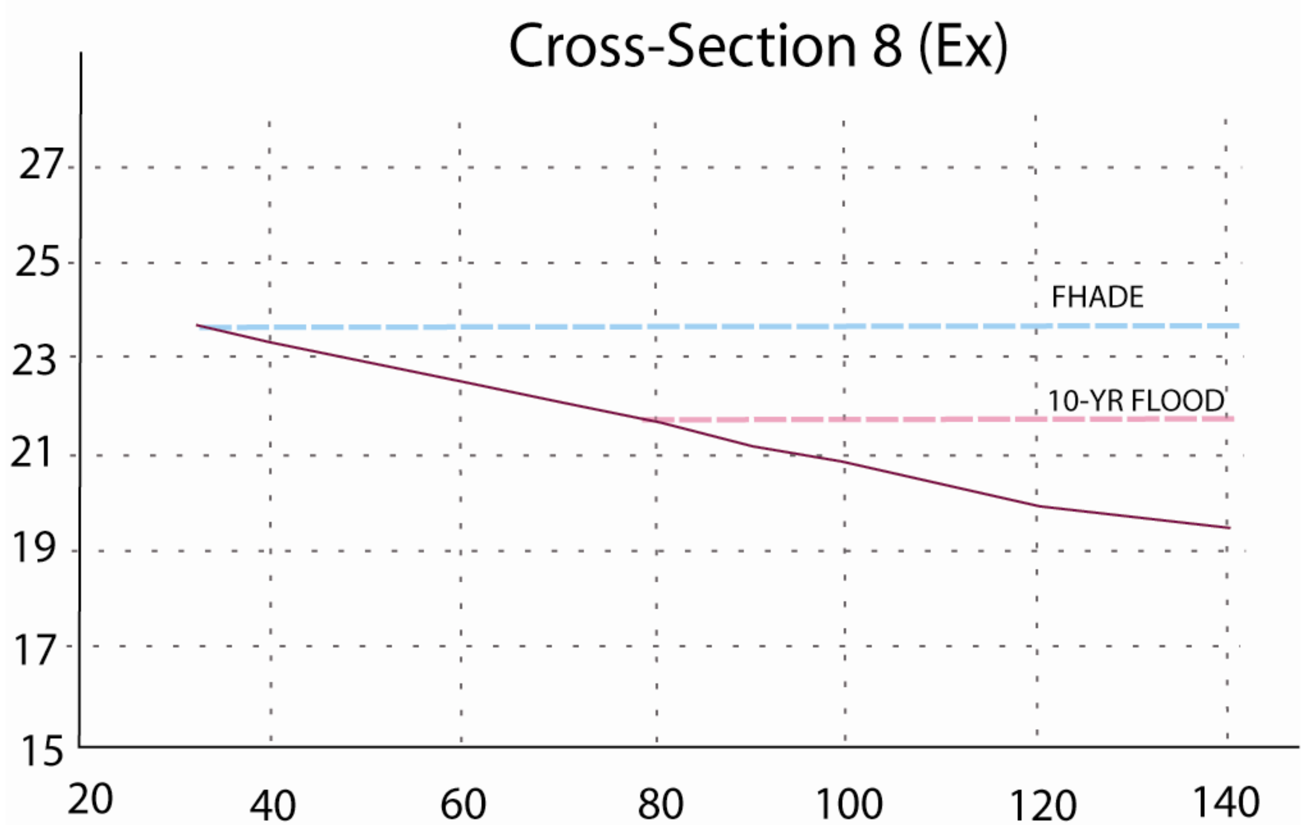
FHADE
10-YR FLOOD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FHADE
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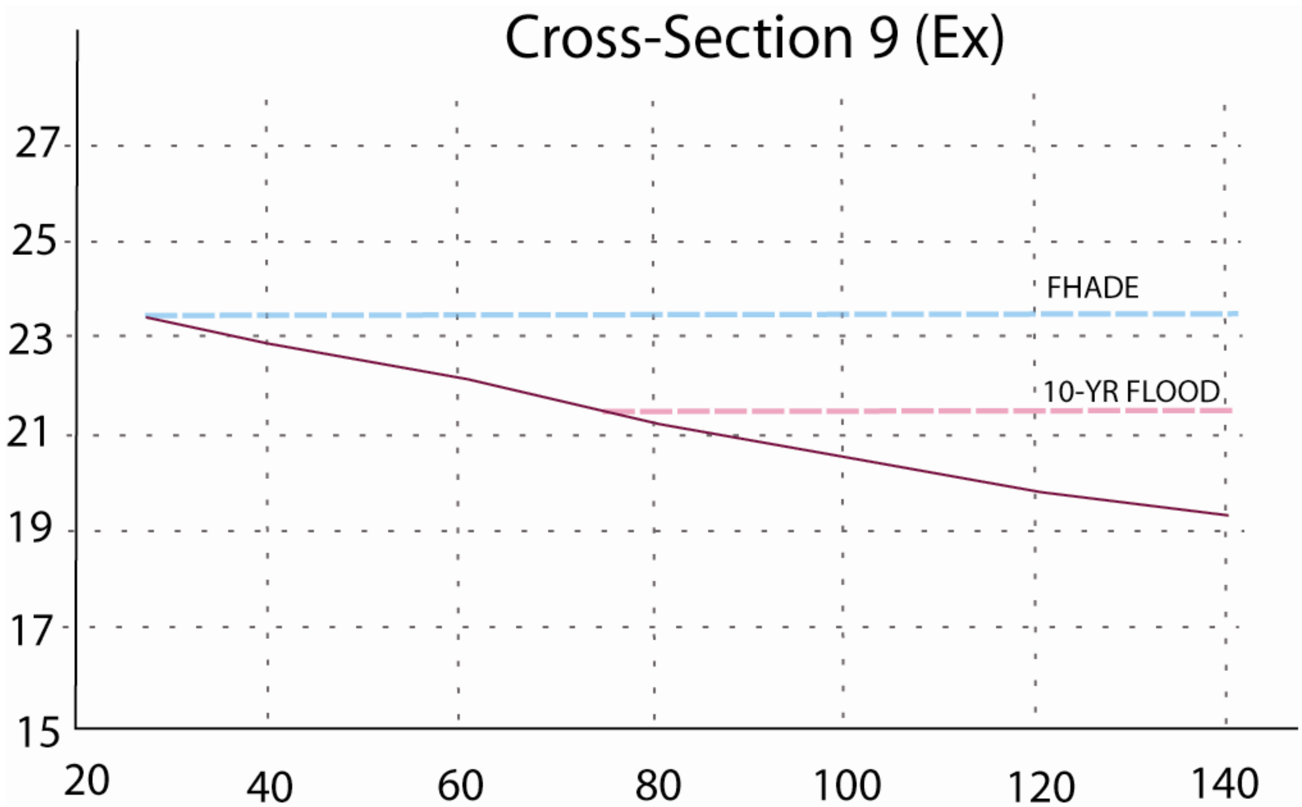
Cross-Section 9 (Ex)
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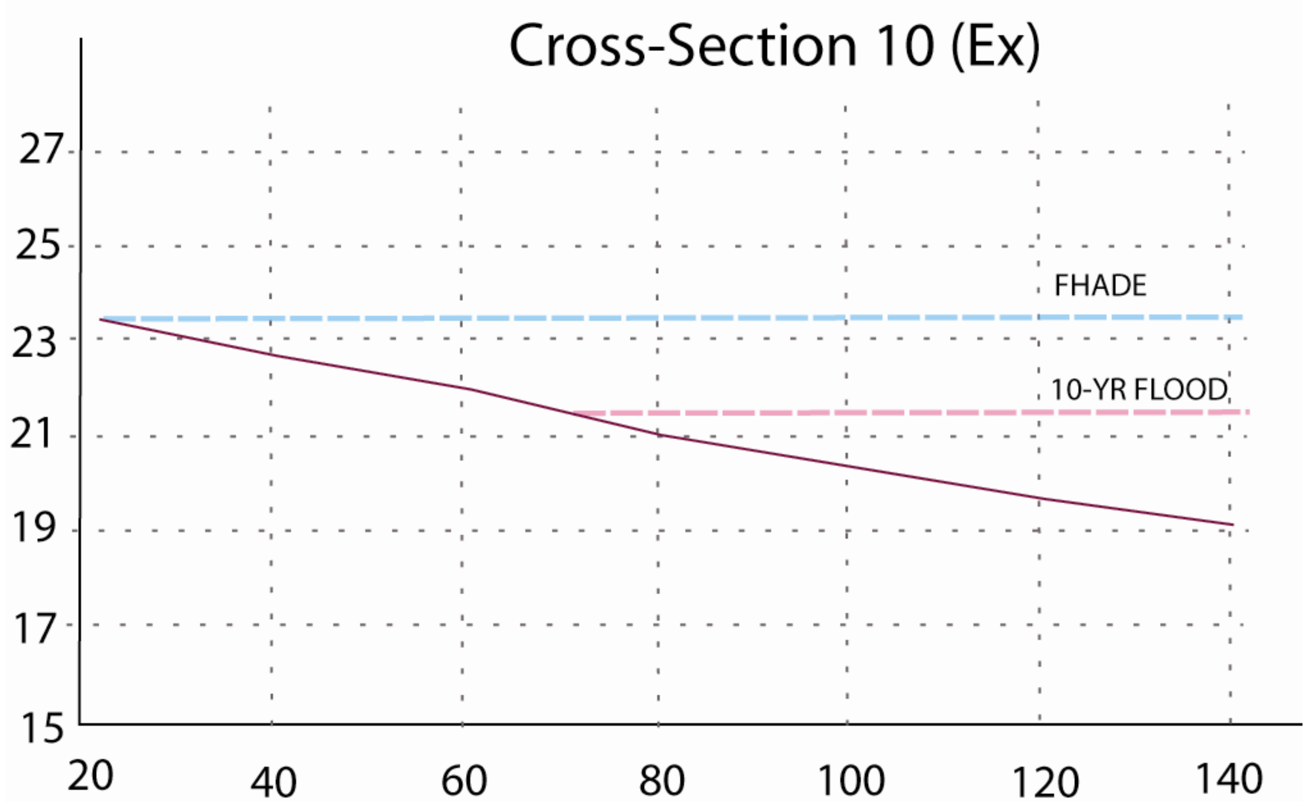
FHADE
10-YR FLOOD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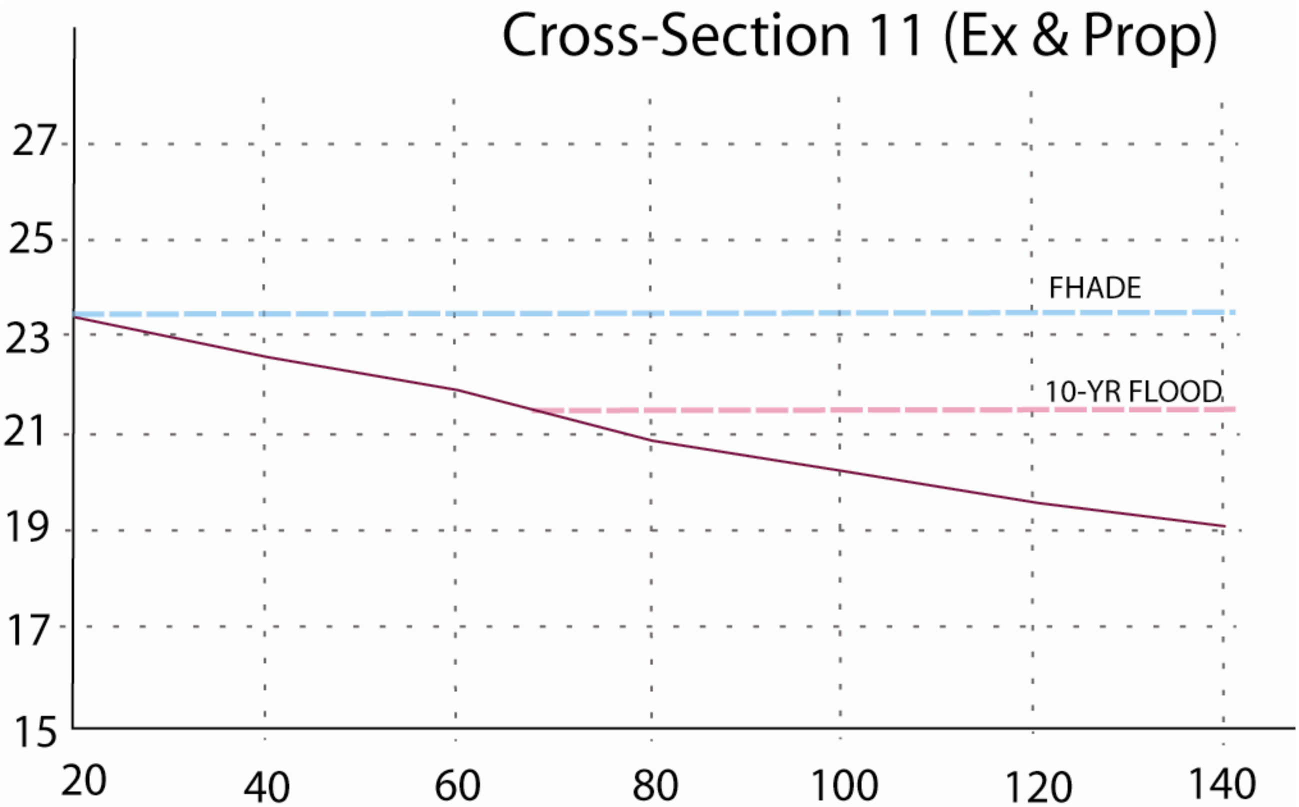
FHADE
10-YR FLOOD


Cross-Section 11 (Ex & Prop)
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10-YR FLOOD
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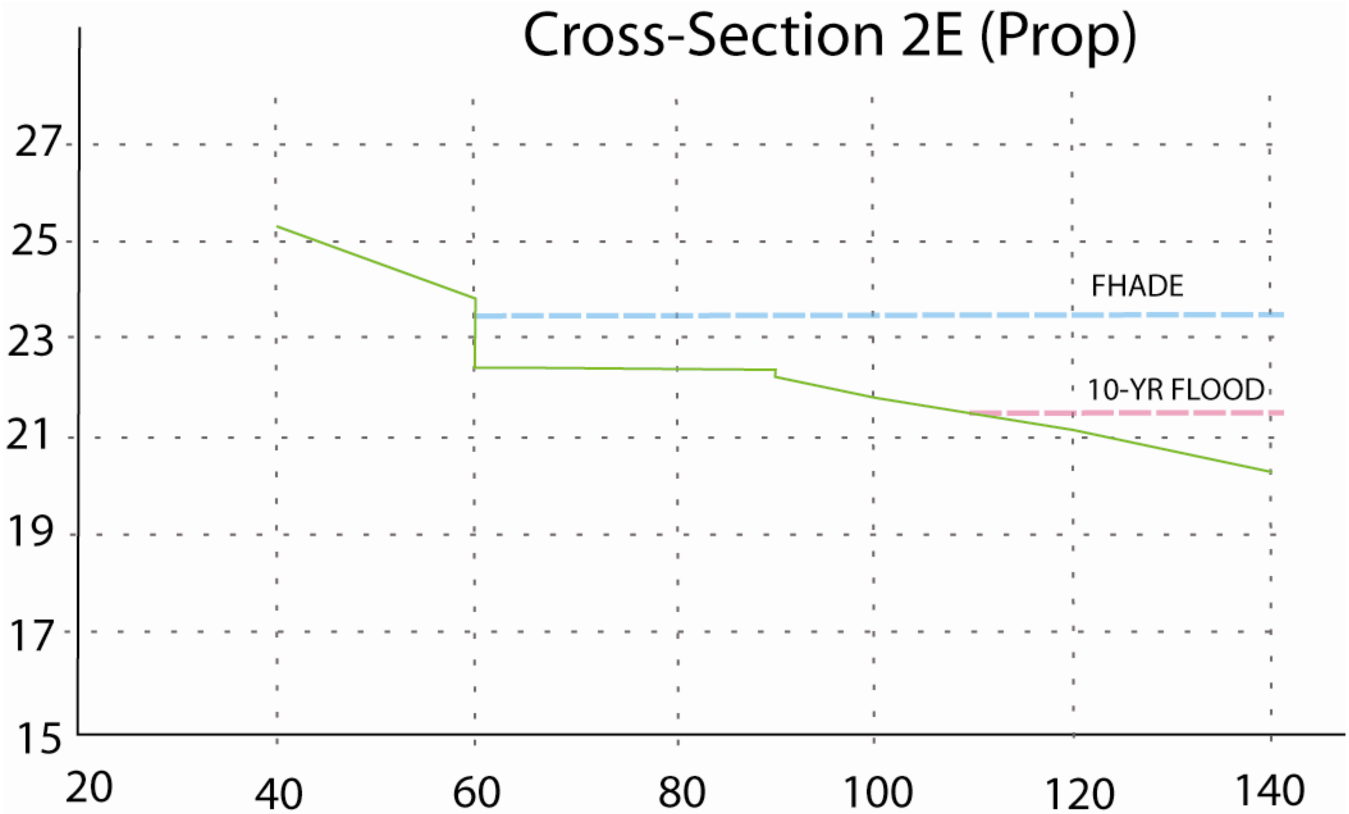
Cross-Section 2E (Prop)
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120
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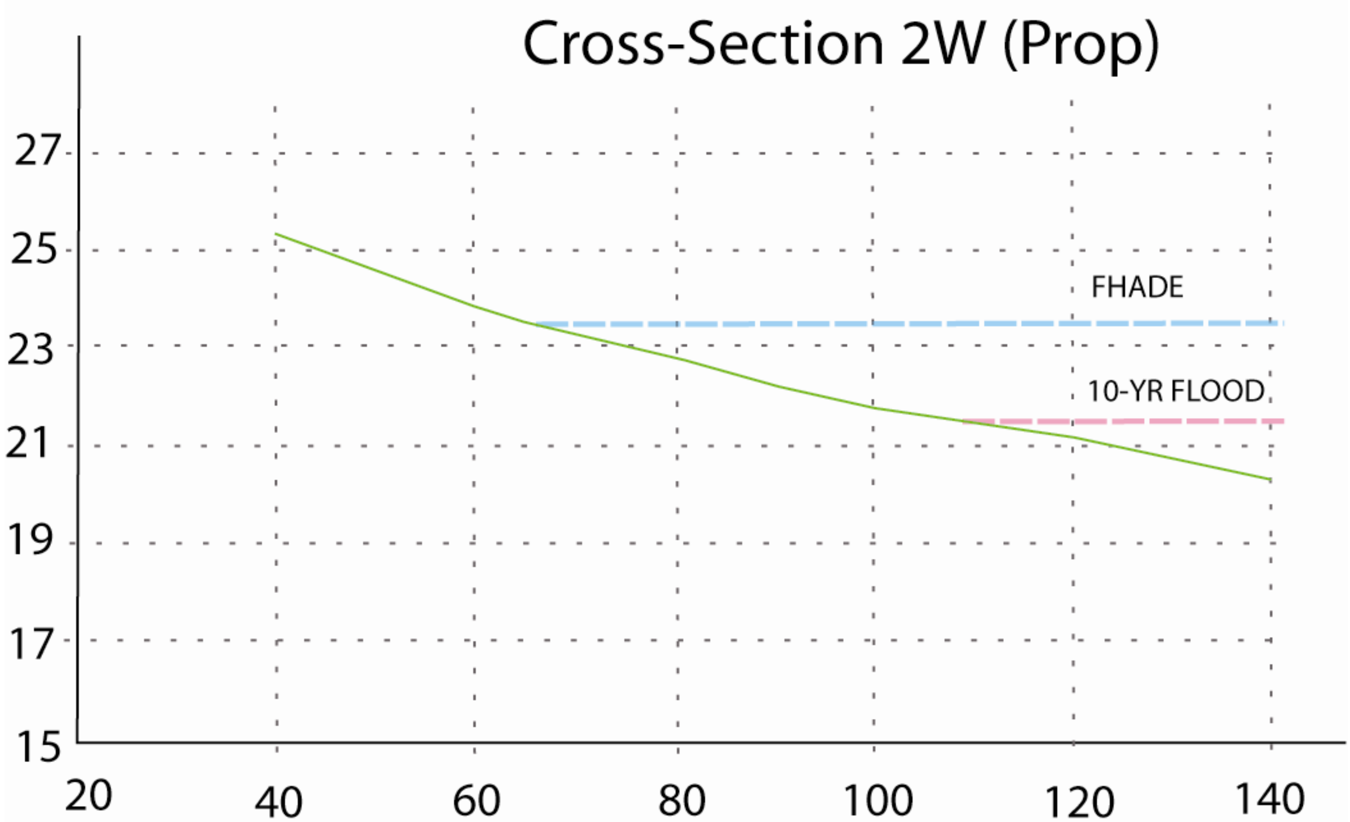
FHADE
10-YR FLOOD


Cross-Section 2W (Prop)
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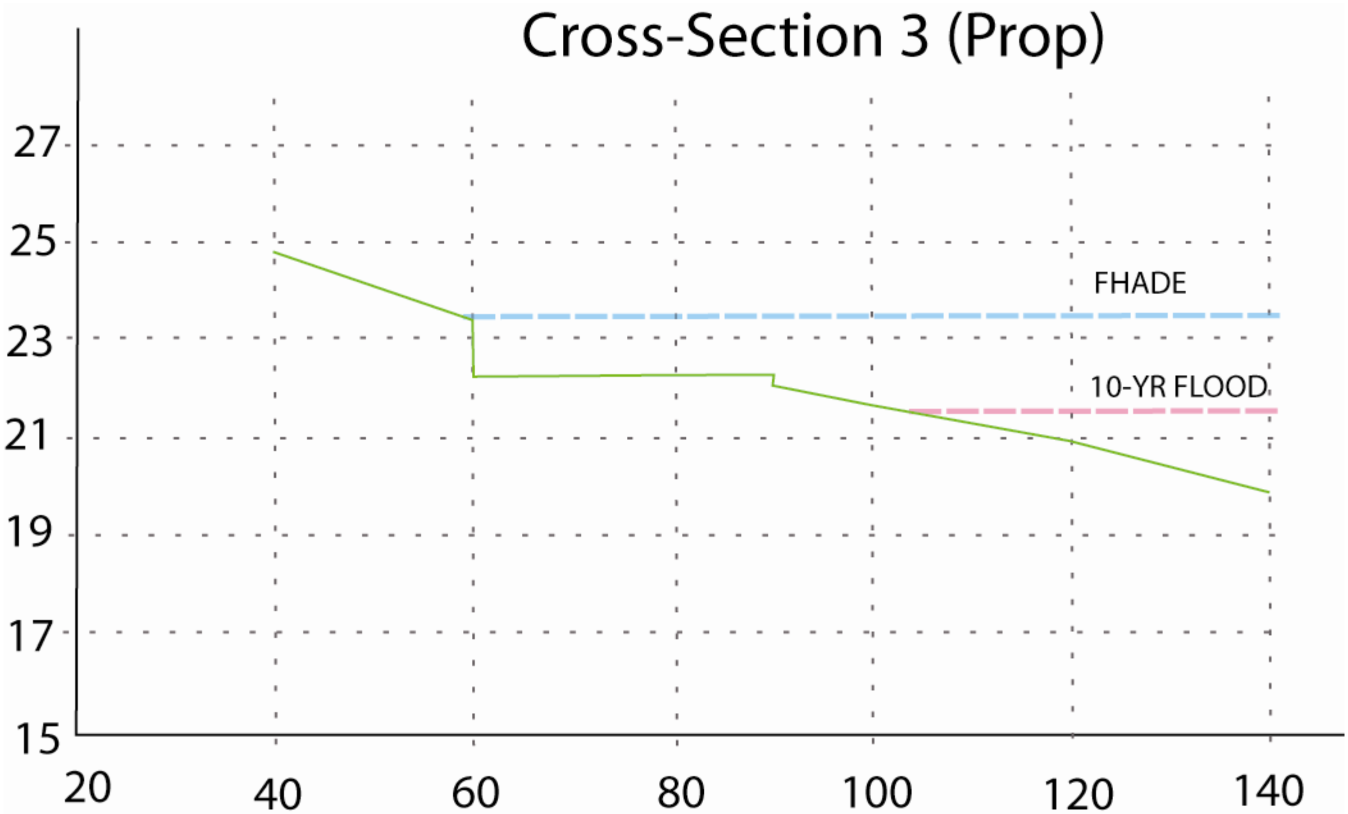
140
FHADE
10-YR FLOOD


Cross-Section 3 (Prop)
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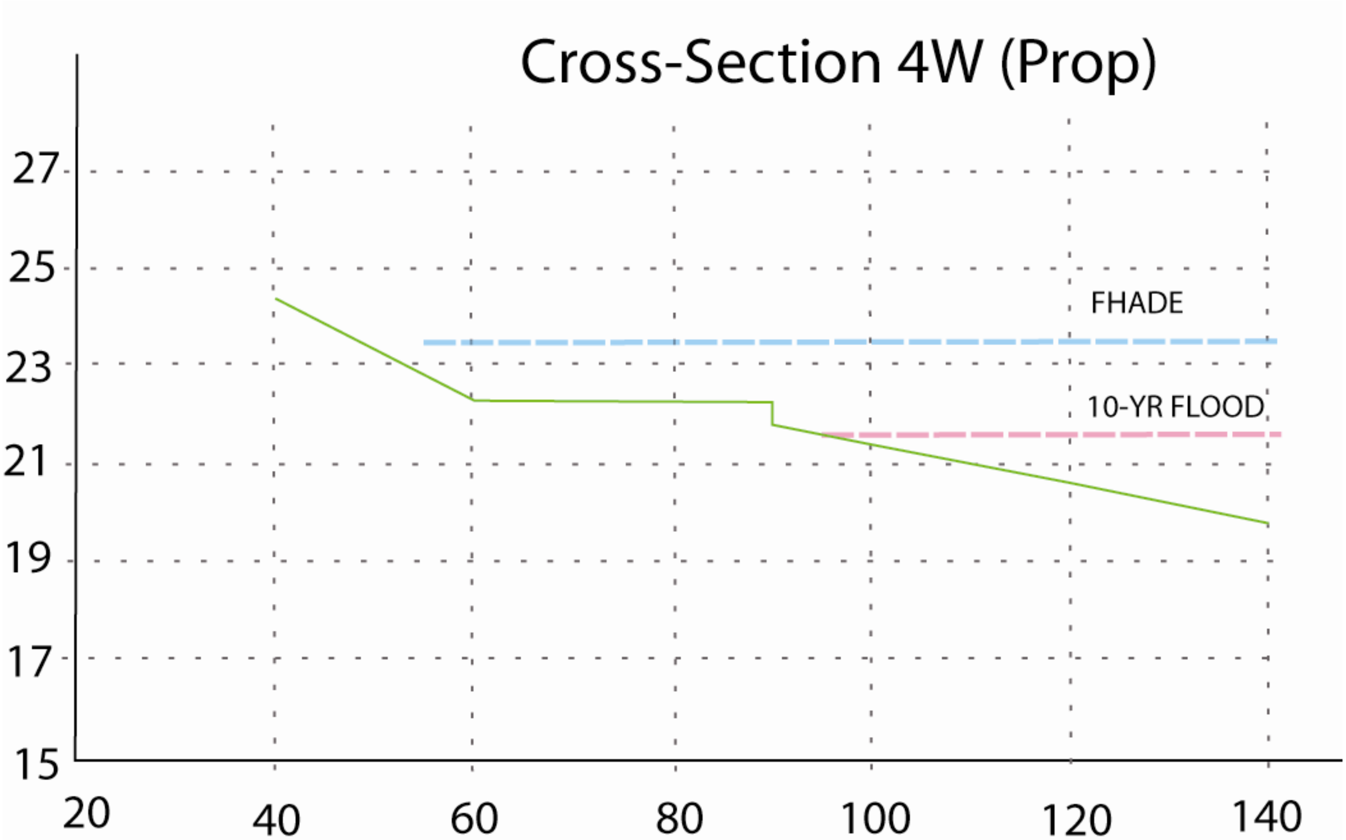
FHADE
10-YR FLOOD


Cross-Section 4W (Prop)
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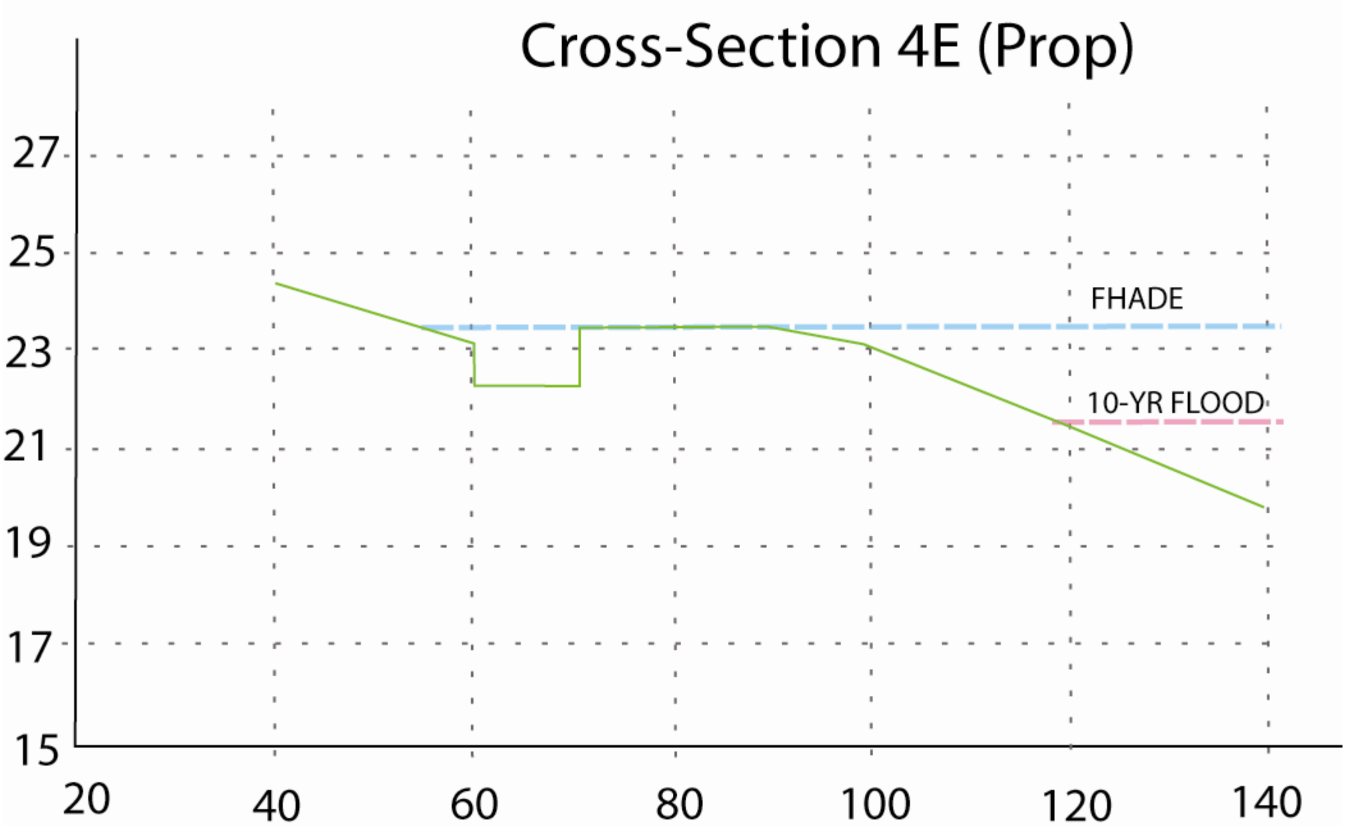
FHADE
10-YR FLOOD


Cross-Section 4E (Prop)
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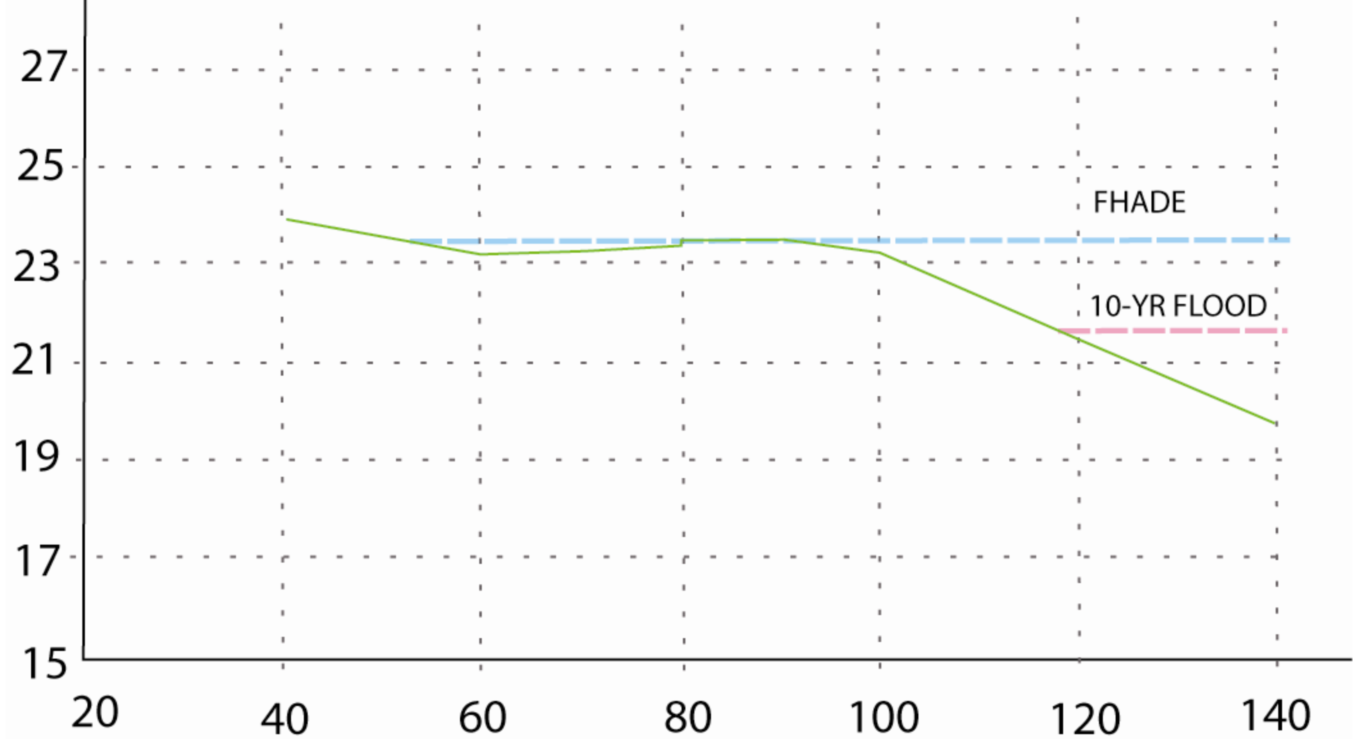
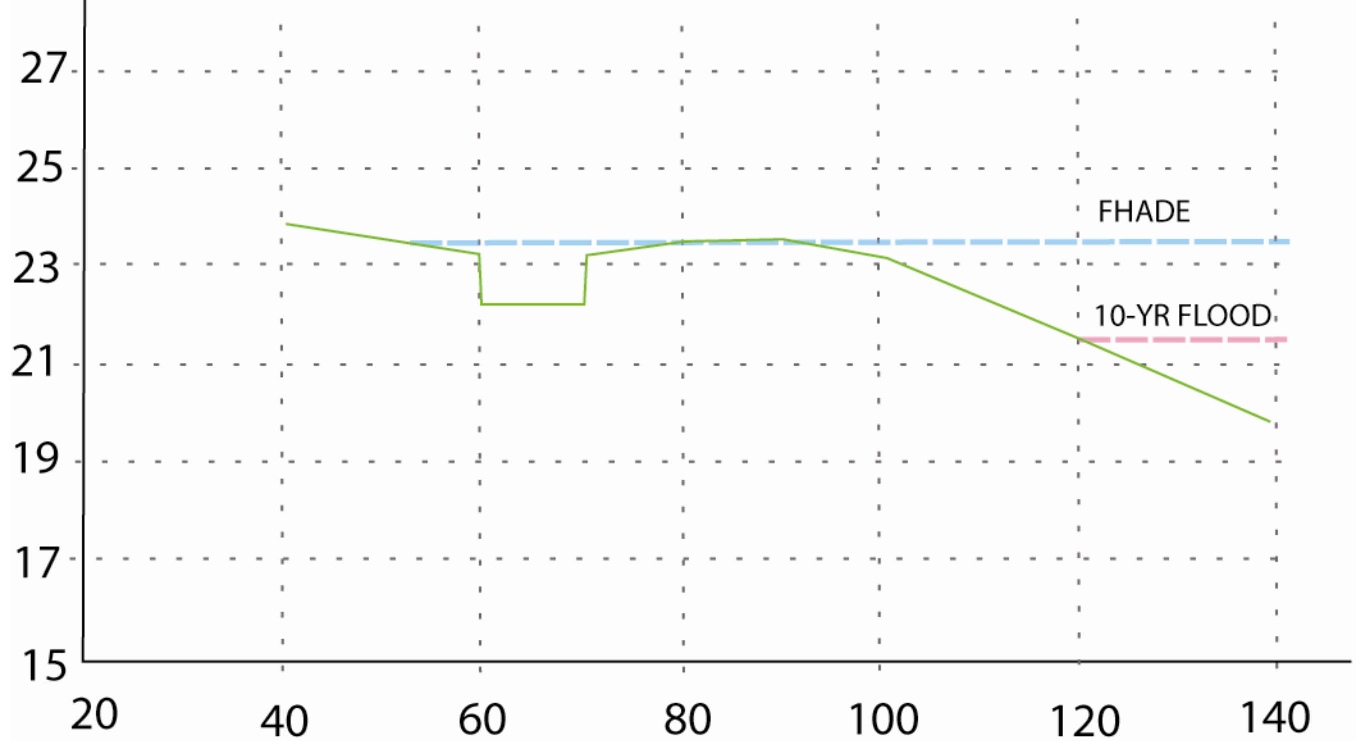
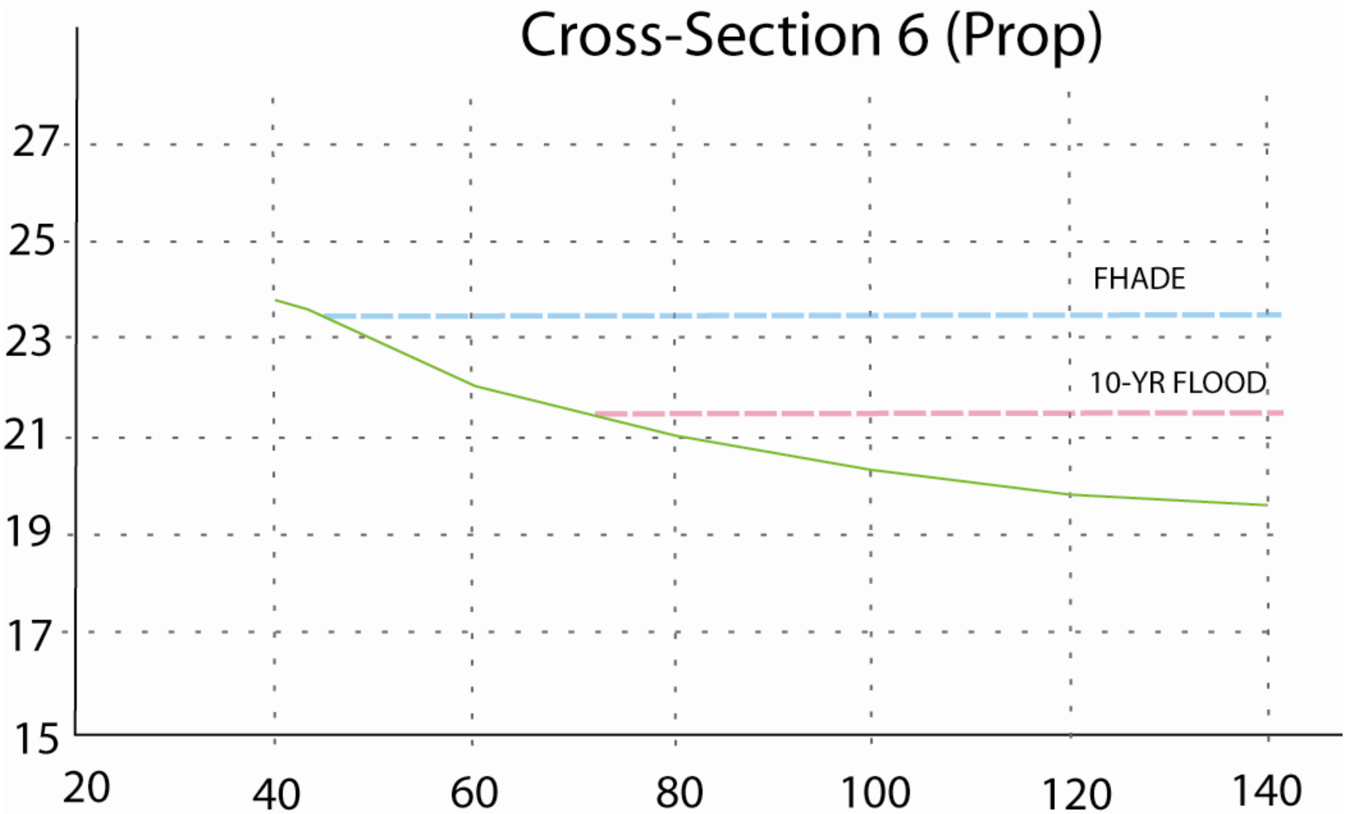
FHADE
10-YR FLOOD

Cross-Section 5E (Prop)



Cross-Section 5W (Prop)




Cross-Section 6 (Prop)
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10-YR FLOOD
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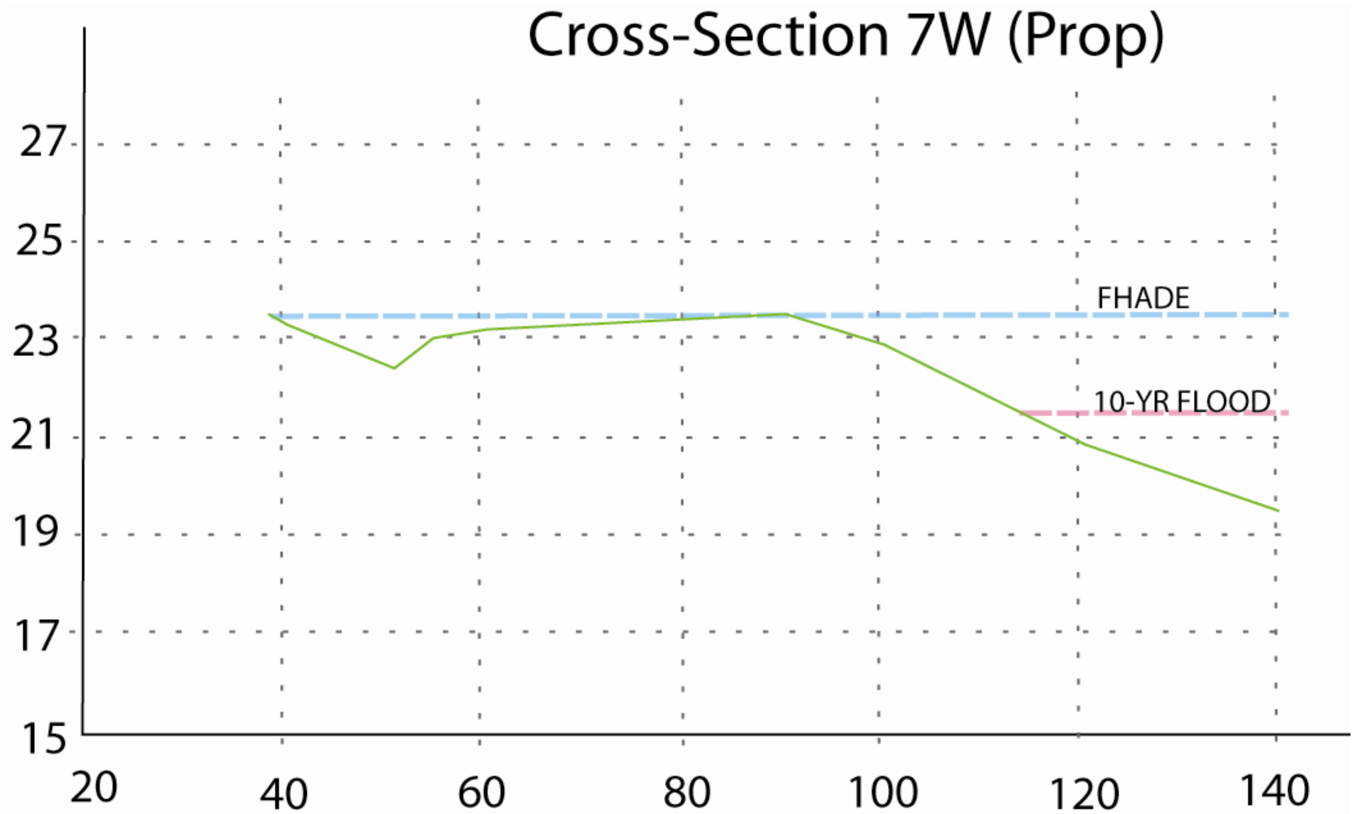

Cross-Section 7W (Prop)
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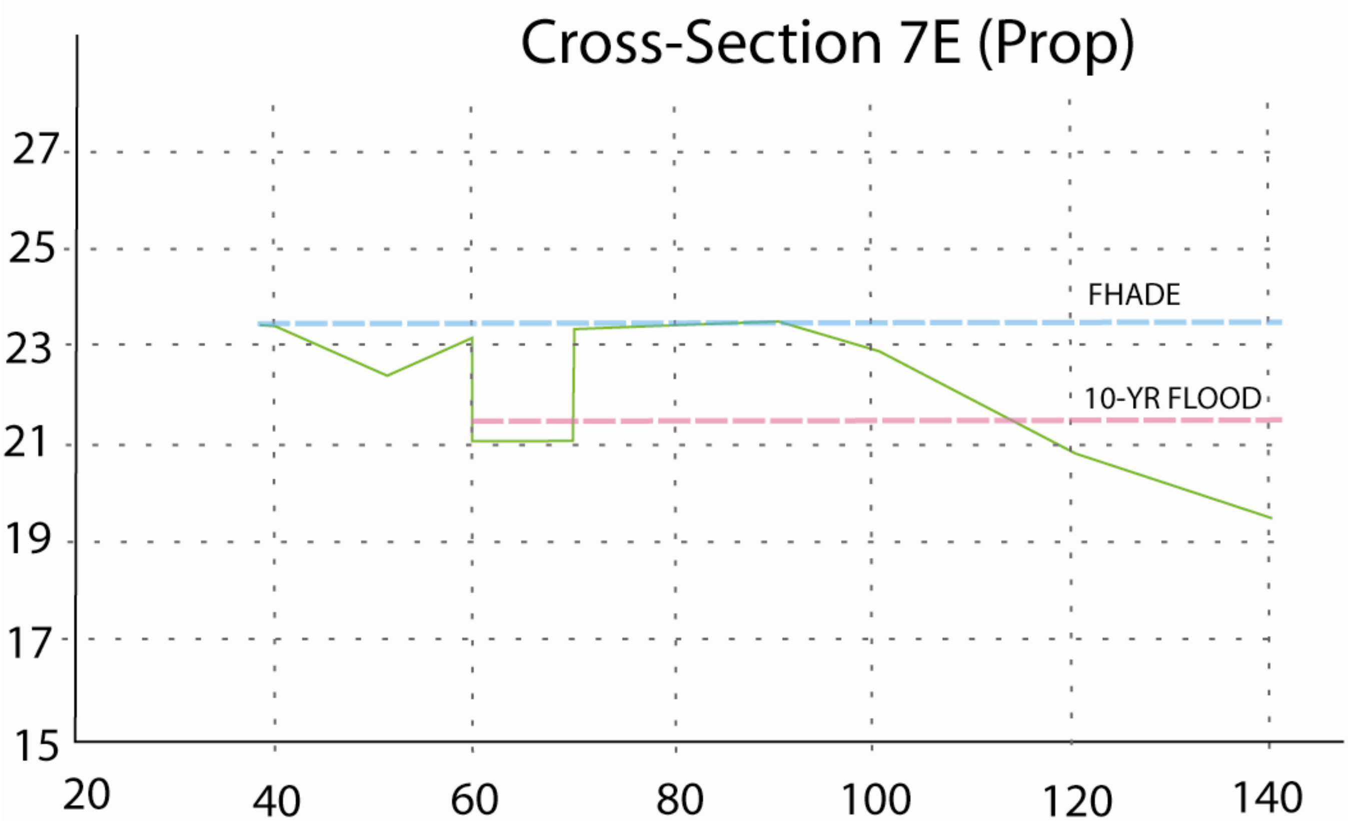
10-YR FLOOD



Cross-Section 7E (Prop)
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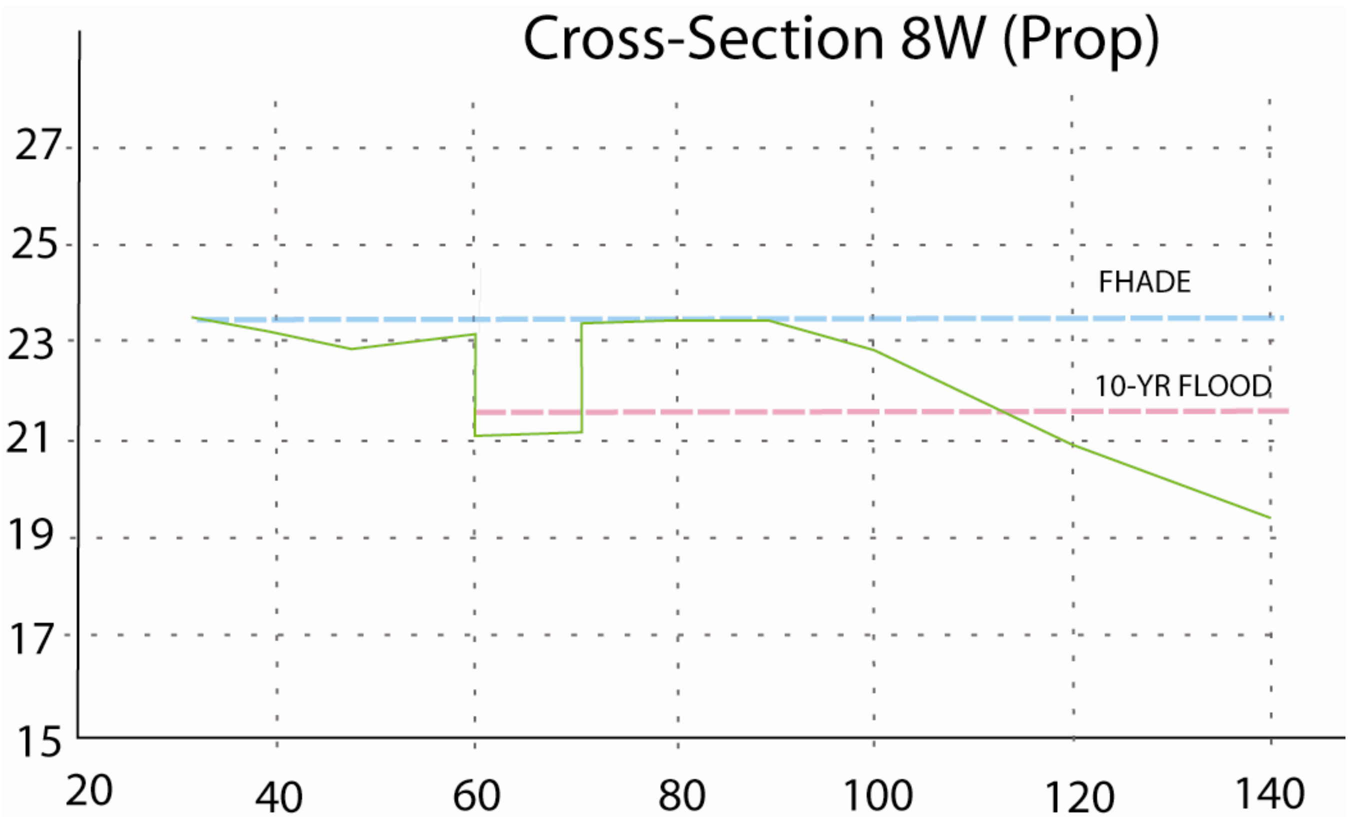
Cross-Section 8W (Prop)
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10-YR FLOOD
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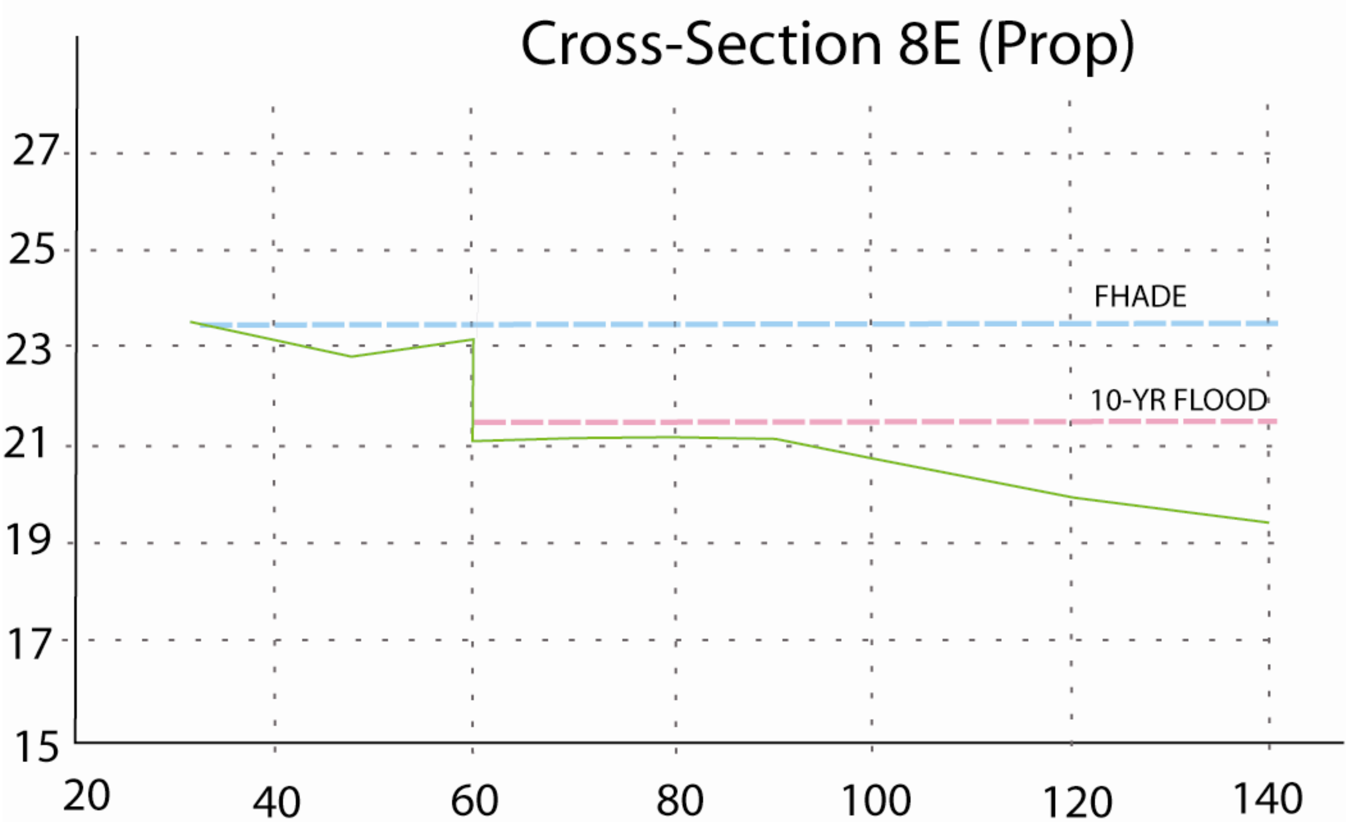
Cross-Section 8E (Prop)
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10-YR FLOOD
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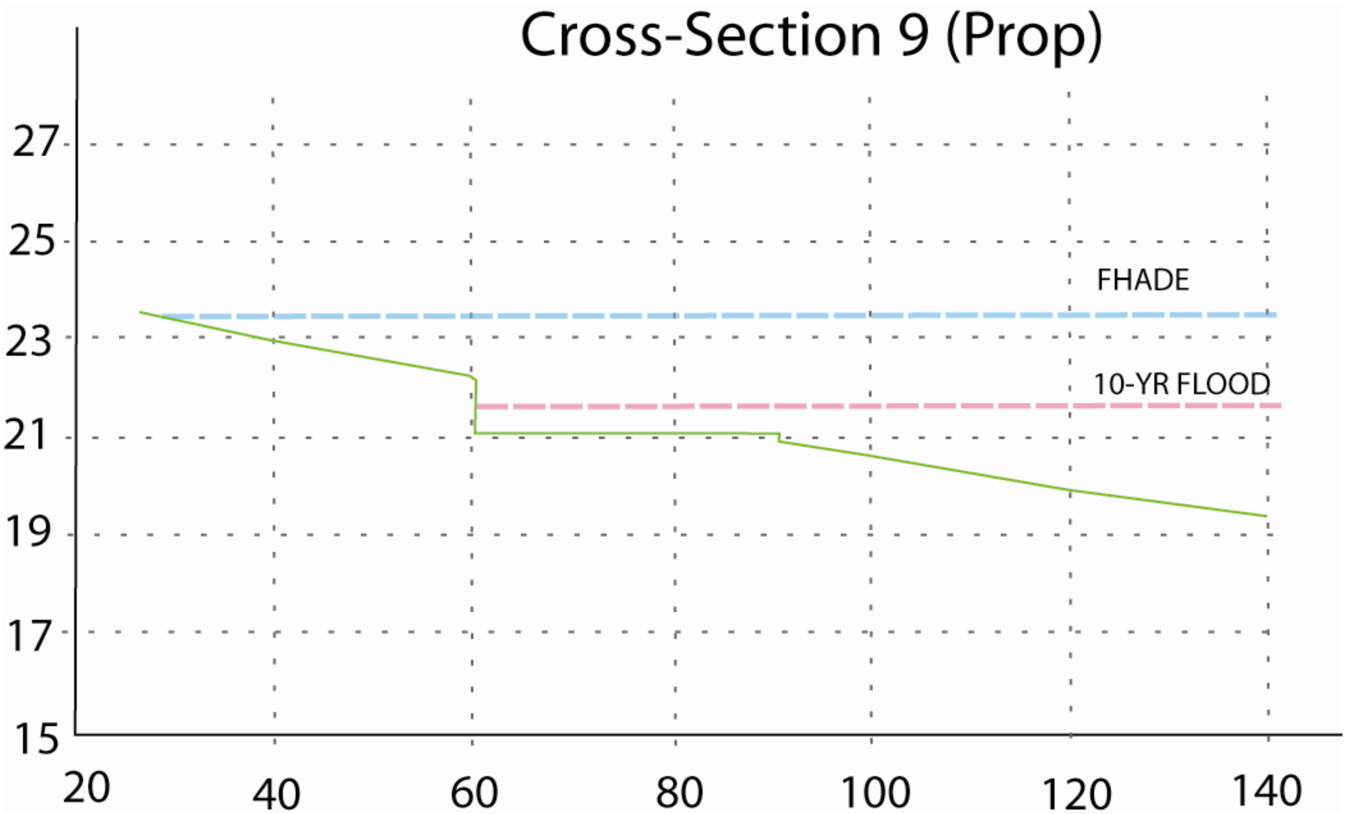

Cross-Section 9 (Prop)
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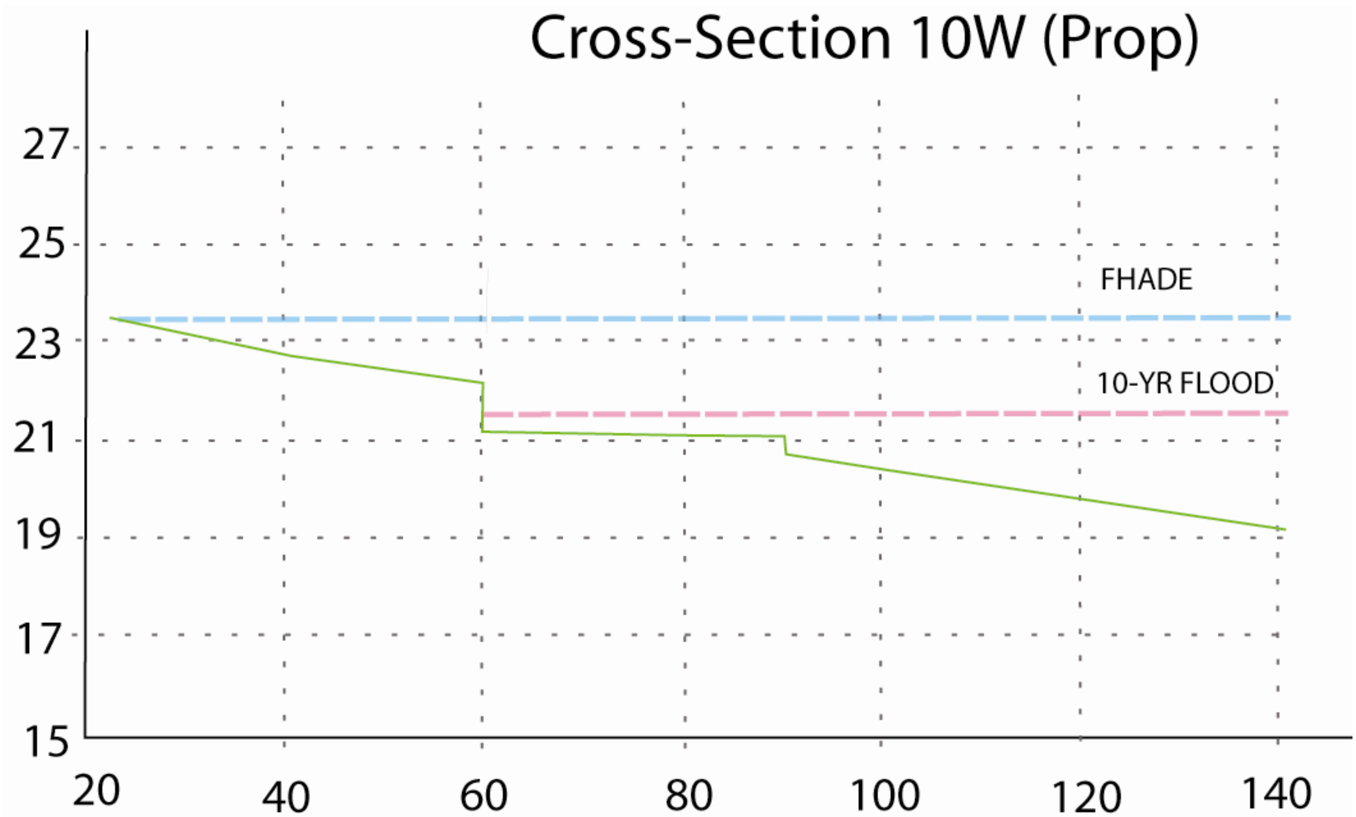
10-YR FLOOD



Cross-Section 10W (Prop)
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10-YR FLOOD
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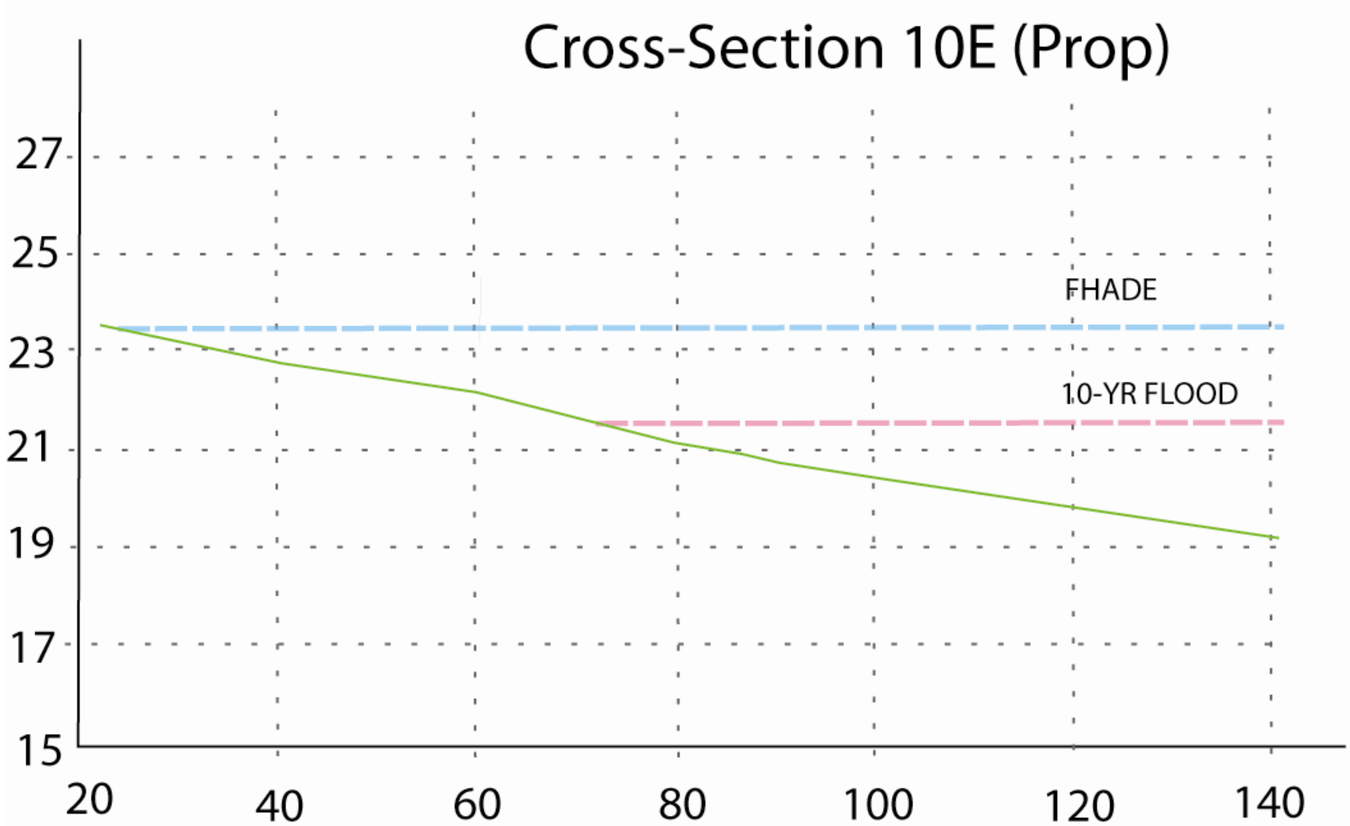

Cross-Section 10E (Prop)
FHADE
10-YR FLOOD
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Table 3.1: Flood Fringe Storage Volume (Average End Area Method)
10-Year Flood Elevation 21.5 NGVD

Existing

	Area (ft^2)	Avg Area (ft^2)	Volume (ft^3)
Section 1	16.2		
		17.8	356
Section 2	19.4		
		23.1	462
Section 3	26.8		
		29.9	598
Section 4	33		
		37.875	757.5
Section 5	42.75		
		46.875	937.5
Section 6	51		
		54.75	1095
Section 7	58.5		
		63.65	1273
Section 8	68.8		
		73.55	1471
Section 9	78.3		
		82.35	1647
Section 10	86.4		
		92	1840
Section 11	97.6		
Existing Storage Volume (cf)			**10437**

Proposed

	Area (ft^2)	Avg Area (ft^2)	Volume (ft^3)
Section 1	16.2		
		17.8	356
Section 2	19.4		
		23.1	462
Section 3	26.8		
		29.9	598
Section 4W	33		
Section 4E	17		
		17.5	350
Section 5	18		
		51.25	1025
Section 6	84.5		
		56.15	1123
Section 7	27.8		
		28.3	566
Section 8W	28.8		
Section 8E	79		
		82.5	1650
Section 9	86		
		88.75	1775
Section 10W	91.5		
Section 10E	86.9		
		92.25	1845
Section 11	97.6		
Storage Volume w/ Walls (cf)			**9750**
Walls			-53
Proposed Storage Volume			**9697**

Table 3.2: Flood Fringe Storage Volume (Average End Area Method)
Design Flood Elevation 23.5 NGVD

Existing

	Area (ft^2)	Avg Area (ft^2)	Volume (ft^3)
Section 1	115		
		122.45	2449
Section 2	129.9		
		137.45	2749
Section 3	145		
		152.5	3050
Section 4	160		
		168	3360
Section 5	176		
		187.9	3758
Section 6	199.8		
		207.7	4154
Section 7	215.6		
		224.05	4481
Section 8	232.5		
		244.2	4884
Section 9	255.9		
		264.05	5281
Section 10	272.2		
		281.675	5633.5
Section 11	291.15		
Existing Storage Volume (cf)			**39799.5**

Proposed

	Area (ft^2)	Avg Area (ft^2)	Volume (ft^3)
Section 1	115		
		122.45	2449
Section 2W	129.9		
Section 2E	149		
		153.5375	3070.75
Section 3	158.075		
		165.9575	3319.15
Section 4W	173.84		
Section 4E	94.25		
		95.05	1901
Section 5W	95.85		
Section 5E	89.35		
		172.05	3441
Section 6	254.75		
		186.625	3732.5
Section 7W	118.5		
Section 7E	138		
		137.6	2752
Section 8W	137.2		
Section 8E	250.2		
		259.55	5191
Section 9	268.9		
		274.8	5496
Section 10W	280.7		
Section 10E	272.7		
		281.925	5638.5
Section 11	291.15		
Storage Volume w/ Walls			36990.9
Walls			-480
Proposed Storage Volume			**36510.9**

Table 3.3: Flood Fringe Storage Volume (Grid Method)
10-Year Flood Elevation 21.5 NGVD

Existing

Grid	Average Elevation	Depth (ft)	Area (ft^2)	Volume (ft^3)
D8&E8	21.0	0.5	422	211
D9	21.3	0.2	115	23
D10	21.2	0.3	205	62
E4	21.4	0.1	25	3
E5	21.3	0.2	150	30
E6	21.2	0.3	240	72
E7	21.1	0.4	325	130
E9	20.8	0.7	400	280
E10	20.7	0.8	400	320
F1	21.3	0.2	185	37
F2	21.2	0.3	275	83
F3	21.1	0.4	360	144
F4	21.0	0.5	400	200
F5	20.8	0.7	400	280
F6	20.6	0.9	400	360
F7	20.4	1.1	400	440
F8	20.2	1.3	400	520
F9	20.1	1.4	400	560
F10	20.0	1.5	400	600
G1	20.7	0.8	400	320
G2	20.5	1.0	400	400
G3	20.3	1.2	400	480
G4	20.2	1.3	400	520
G5	20.0	1.5	400	600
G6	19.9	1.6	400	640
G7	19.7	1.8	400	720
G8	19.6	1.9	400	760
G9	19.5	2.0	400	800
G10	19.4	2.1	400	840
			Total:	**10434**

Proposed

Grid	Average Elevation	Depth (ft)	Area (ft^2)	Volume (ft^3)
D5	21.3	0.2	50	10
D6	21.2	0.3	50	15
D7	Cr Space	0.4	200	80
D8	Cr Space	0.4	400	160
D9	Cr Space	0.4	400	160
D10	21.2	0.3	205	62
E5	20.8	0.7	180	126
E6	20.8	0.7	180	126
E8	Cr Space	0.4	200	80
EE8	20.8	0.7	190	133
E9	Cr Space	0.4	200	80
EE9	20.6	0.9	200	180
E10	20.7	0.8	400	320
F1	21.4	0.1	185	19
F2	21.3	0.2	275	55
F3	21.2	0.3	340	102
F5	20.6	0.9	303	273
F6	20.5	1.0	350	350
F7	21.2	0.3	147	44
F8	20.2	1.3	380	494
F9	20.1	1.4	400	560
F10	20.0	1.5	400	600
G1	20.7	0.8	400	320
G2	20.5	1.0	400	400
G3	20.3	1.2	395	474
G4	20.6	0.9	405	365
G5	19.9	1.6	400	640
G6	19.8	1.7	400	680
G7	20.2	1.3	405	527
G8	19.6	1.9	395	751
G9	19.5	2.0	400	800
G10	19.4	2.1	400	840
			Internal Walls:	-53
			Total:	**9770**

Table 3.4: Flood Fringe Storage Volume (Grid Method)
Design Flood Elevation 23.5 NGVD

Existing					Proposed				
Grid	Av Elev	Depth (ft)	Area (ft^2)	Volume (ft^3)	Grid	Av Elev	Depth (ft)	Area (ft^2)	Volume (ft^3)
A10&B10	23.1	0.4	410	164	A10&B10	23.1	0.4	410	164
B6&C6	23.0	0.5	385	193	B6&C6	23.0	0.5	385	193
B7	23.4	0.1	90	9	B7	23.4	0.1	90	9
B8	23.3	0.2	195	39	B8	23.3	0.2	195	39
B9	23.2	0.3	305	92	B9	23.2	0.3	305	92
C3	23.4	0.1	70	7	C3	23.4	0.1	70	7
C4	23.3	0.2	175	35	C4	23.3	0.2	175	35
C5	23.2	0.3	280	84	C5	23.1	0.4	280	112
C7	22.9	0.6	400	240	C7	22.9	0.6	400	240
C8	22.7	0.8	400	320	C8	22.8	0.7	400	280
C9	22.5	1.0	400	400	C9	22.5	1.0	400	400
C10	22.3	1.2	400	480	C10	22.3	1.2	400	470
D1	23.2	0.3	250	75	D1	23.2	0.3	250	75
D2	23.1	0.4	350	140	D2	Cr Space	1.2	400	480
D3	22.9	0.6	400	240	D3	Cr Space	1.2	400	480
D4	22.6	0.9	400	360	D4	Cr Space	1.2	200	240
D5	22.4	1.1	400	440	D5	22.3	1.2	400	480
D6	22.2	1.3	400	520	D6	22.3	1.2	400	480
D7	22.1	1.4	400	560	D7	Cr Space	2.4	200	480
D8	21.9	1.6	400	640	D8	Cr Space	2.4	400	960
D9	21.7	1.8	400	720	D9	Cr Space	2.4	400	960
D10	21.5	2.0	400	800	D10	21.5	2.0	400	800
E1	22.4	1.1	400	440	E1	22.4	1.1	400	440
E2	22.2	1.3	400	520	E2	Cr Space	1.2	200	240
E3	22.0	1.5	400	600	EE2	22.0	1.5	200	300
E4	21.8	1.7	400	680	E3	Cr Space	1.2	200	240
E5	21.6	1.9	400	760	EE3	21.8	1.7	190	323
E6	21.4	2.1	400	840	EE4	23.4	0.1	210	21
E7	21.3	2.2	400	880	E5	21.8	1.7	400	680
E8	21.0	2.5	400	1000	E6	21.7	1.8	400	720
E9	20.8	2.7	400	1080	EE7	23.2	0.3	210	63
E10	20.7	2.8	400	1120	E8	Cr Space	2.4	200	480
F1	21.6	1.9	400	760	EE8	20.8	2.7	190	513
F2	21.4	2.1	400	840	E9	Cr Space	2.4	200	480
F3	21.2	2.3	400	920	EE9	20.6	2.9	200	580
F4	21.0	2.5	400	1000	E10	20.7	2.8	400	1120
F5	20.8	2.7	400	1080	F1	21.6	1.9	400	760
F6	20.6	2.9	400	1160	F2	21.4	2.1	400	840
F7	20.4	3.1	400	1240	F3	21.2	2.3	380	874
F8	20.2	3.3	400	1320	F4	22.4	1.1	420	462

F9	20.1	3.4	400	1360
F10	20.0	3.5	400	1400
G1	20.7	2.8	400	1120
G2	20.5	3.0	400	1200
G3	20.3	3.2	400	1280
G4	20.2	3.3	400	1320
G5	20.0	3.5	400	1400
G6	19.9	3.6	400	1440
G7	19.7	3.8	400	1520
G8	19.6	3.9	400	1560
G9	19.5	4.0	400	1600
G10	19.4	4.1	400	1640
			Total:	**39637**

F5	21.0	2.5	400	1000
F6	20.8	2.7	400	1080
F7	21.9	1.6	420	672
F8	20.2	3.3	380	1254
F9	20.1	3.4	400	1360
F10	20.0	3.5	400	1400
G1	20.7	2.8	400	1120
G2	20.5	3.0	400	1200
G3	20.3	3.2	395	1264
G4	20.6	2.9	405	1175
G5	19.9	3.6	400	1440
G6	19.8	3.7	400	1480
G7	20.2	3.3	405	1337
G8	19.6	3.9	395	1541
G9	19.5	4.0	400	1600
G10	19.4	4.1	400	1640
			Internal Walls:	-480
			Total:	**36693**

Section 4

Riparian Zone

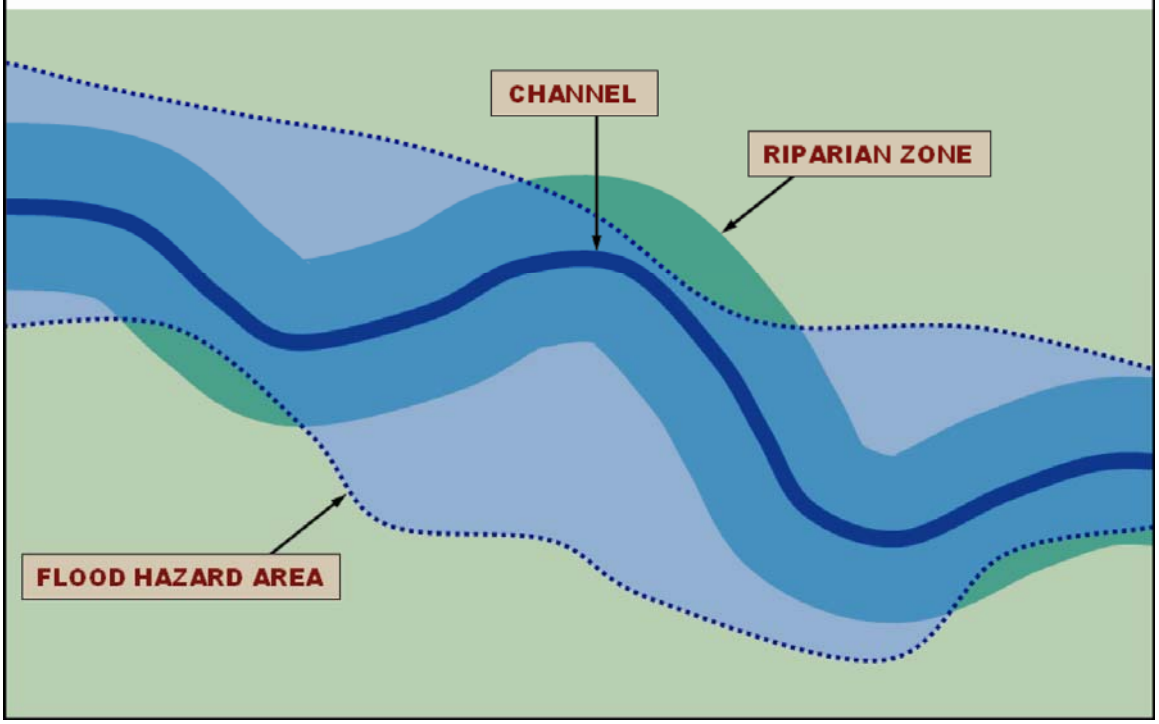
4.1 Introduction

The Flood Hazard Area Control Act rules identify two distinct areas that are regulated: the flood hazard area and the riparian zone. Pursuant to N.J.A.C. 7:13-2.2, nearly all waters in New Jersey are regulated with the exception of the following:

1. Any manmade canal;
2. Any coastal wetland regulated under the Wetlands Act of 1970 (N.J.S.A. 13:9A-1 et seq.); and,
3. Any segment of water that has a drainage area of less than 50 acres, provided one or more of the following applies:
   - The water has no discernible channel;
   - The water is confined within a lawfully existing, manmade conveyance structure or drainage feature, such as a pipe, culvert, ditch, channel or basin (not including any water that historically possessed a naturally-occurring, discernible channel, which has been piped, culverted, ditched or similarly modified); and/or
   - The water is not connected to a regulated water by a channel or pipe, such as an isolated pond or depression that has no outlet.

Under N.J.A.C. 7:13-2.3, all regulated waters draining at least 50 acres have a flood hazard area. Regulated waters that drain less than 50 acres do not have a flood hazard area that is regulated under the Flood Hazard Area Control Act rules. However, all regulated waters have a riparian zone regardless of the water's drainage area, except there is no riparian zone along the Atlantic Ocean nor along any manmade lagoon, stormwater management basin, or oceanfront barrier island, spit or peninsula. There is also no riparian zone along piped sections of an otherwise regulated water. (Note: this is not stated in the Flood Hazard Area Control Act rules but is addressed in the response to comments 347 and 348 in the adoption of these rules at 39 N.J.R. 4620). The regulated water itself is also part of the riparian zone. The methods for determining the limits of the riparian zone are described at N.J.A.C. 7:13-4.1. Figure 4.1 below illustrates how the flood hazard area and riparian zone overlap along a typical regulated water.

Figure 4.1



4.2 The Riparian Zone

The riparian zone is the land and vegetation both within a regulated water and within either 50 feet, 150 feet or 300 feet from the top of bank along both sides of a regulated water. If no discernible top of bank is present, the Flood Hazard Area Control Act rules at N.J.A.C. 7:13-4.1(b) explain how to measure the riparian zone (see section 4.3 below). Given the many important ecological functions that a healthy riparian zone provides, adequately preserving such areas is essential to protecting New Jersey's natural resources and water supply. The width of the riparian zone along each regulated water is described at N.J.A.C. 7:13-4.1 and is summarized as follows:

1. The riparian zone is 300 feet wide along both sides of any Category One water, and all upstream tributaries situated within the same HUC-14 watershed.
2. The riparian zone is 150 feet wide along both sides of the following waters not identified in 1 above:
   i. Any trout production water and all upstream waters (including tributaries);

ii. Any trout maintenance water and all upstream waters (including tributaries) within one linear mile as measured along the length of the regulated water;

iii. Any segment of a water flowing through an area that contains documented habitat for a threatened or endangered species of plant or animal, which is critically dependent on the regulated water for survival, and all upstream waters (including tributaries) within one linear mile as measured along the length of the regulated water; and

iv. Any segment of a water flowing through an area that contains acid producing soils.

3. The riparian zone is 50 feet wide along both sides of all waters not identified in 1 or 2 above.

It should be noted that the Department's Stormwater Management rules at N.J.A.C. 7:8 also establish a 300-foot Special Water Resource Protection Area (SWRPA) along Category One waters and certain tributaries. However, the SWRPA exists only when a major development (as defined at N.J.A.C. 7:8-1.2) is proposed, and only if the feature is mapped on USGS Quadrangle Maps or County Soil Surveys. The 300-foot riparian zone in the Flood Hazard Area Control Act rules, however, applies independently of the size of development being proposed, and regardless of whether a feature is shown on these maps. Therefore, more features in the State will have a 300-foot riparian zone under the Flood Hazard Area Control Act rules than will have a SWRPA under the Stormwater Management rules.

4.3 Determining Top of Bank

The Flood Hazard Area Control Act rules at N.J.A.C. 7:13-1.2 define bank as "the inclined side of a channel, an excavated or impounded area or a topographic depression, which confines and/or conducts water." Along linear features (such as a stream or river), the top of bank is usually the well-defined break at the top of the slope where the channel ends. (See Figure 4.2 below.)

Since the bank is actually part of the channel, the top of bank cannot be not outside or beyond the channel itself. "Channel" is defined at N.J.A.C. 7:13-1.2 as a "linear topographic depression that continuously or intermittently confines and/or conducts surface water, not including transient erosional gullies and other ephemeral features that temporarily form after heavy rainfall. A channel can be naturally occurring or can be of human origin through excavation or construction. A channel includes both bed and banks." The channel, therefore, conveys water on a regular or semi-regular basis and/or after a typical rainfall event, and does not include the entirety of deep ravines, bluffs or other large embankments or slopes that may lie adjacent to a channel. In addition, the terms "transient" and "ephemeral" refer to the presence of the channel itself and not the regularity with which water flows through the channel.

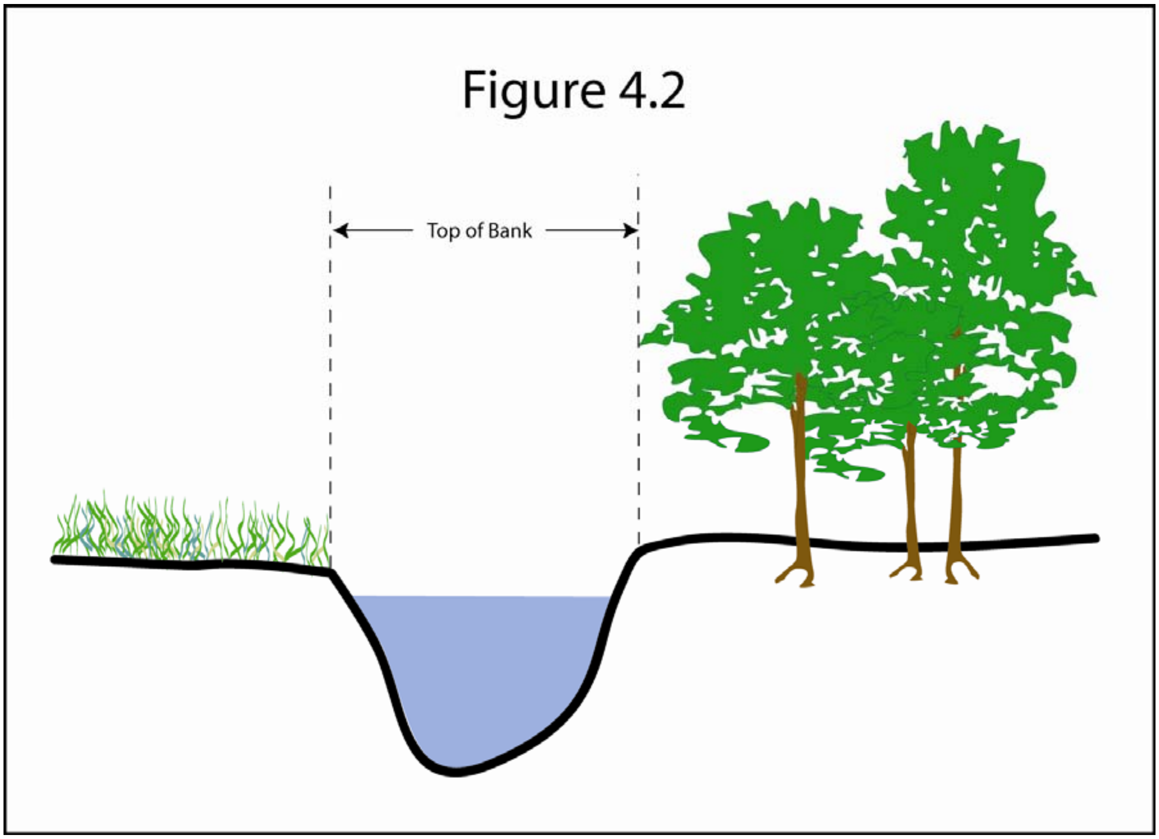


Figure 4.2
Top of Bank

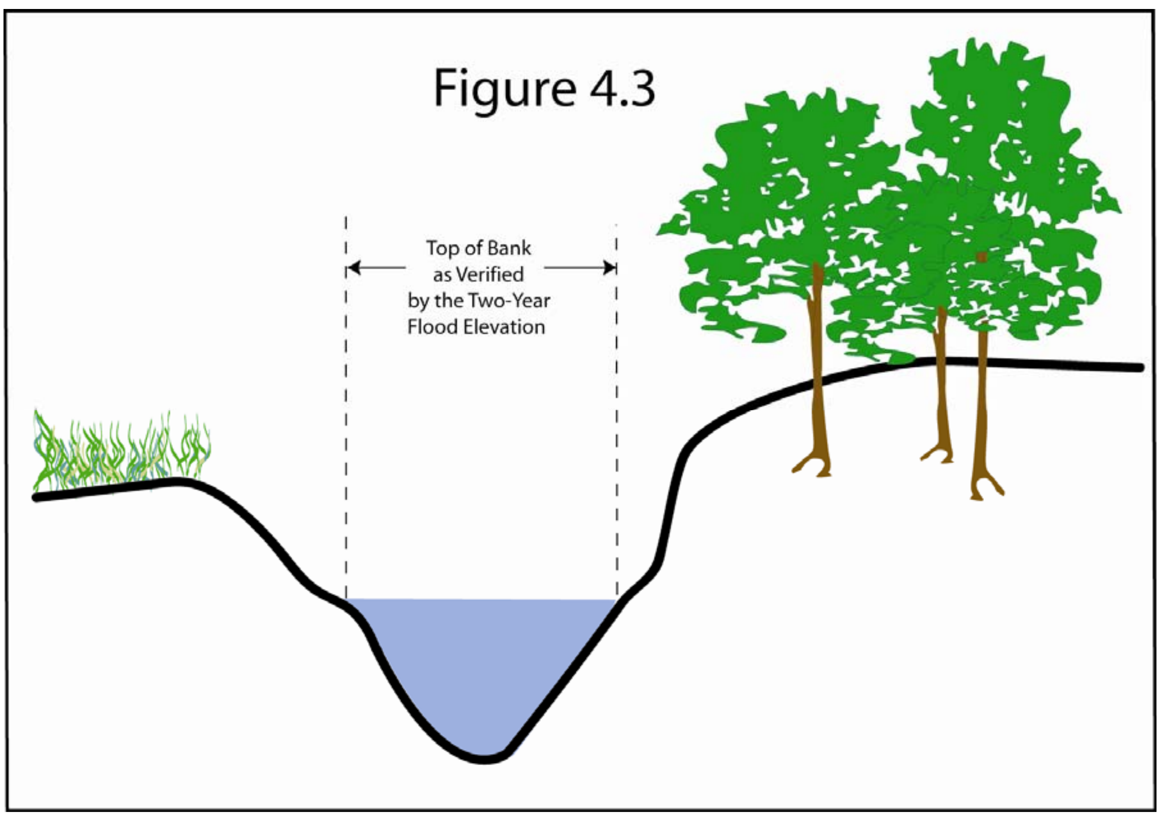
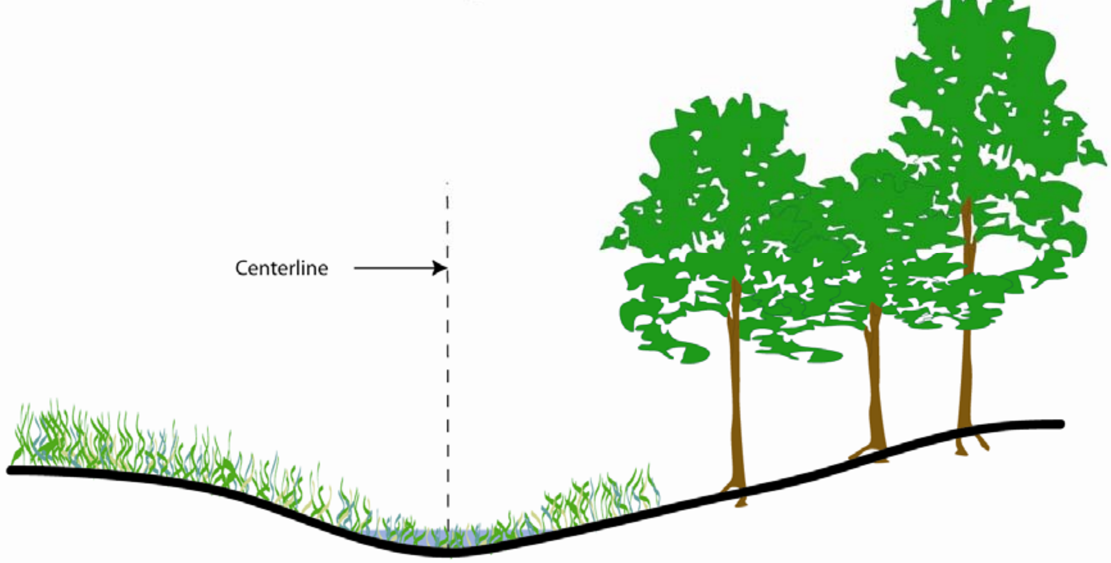


Figure 4.3
Top of Bank
as Verified
by the Two-Year
Flood Elevation

In cases where it is difficult to determine the precise location of the top of bank, calculations can be performed to determine the depth of the two-year flood along the water in question. The flow capacity of a typical natural channel rarely exceeds the two-year flood. As such, the top of bank will generally not lie outside of the two-year flood limits. (See Figure 4.3 above.)

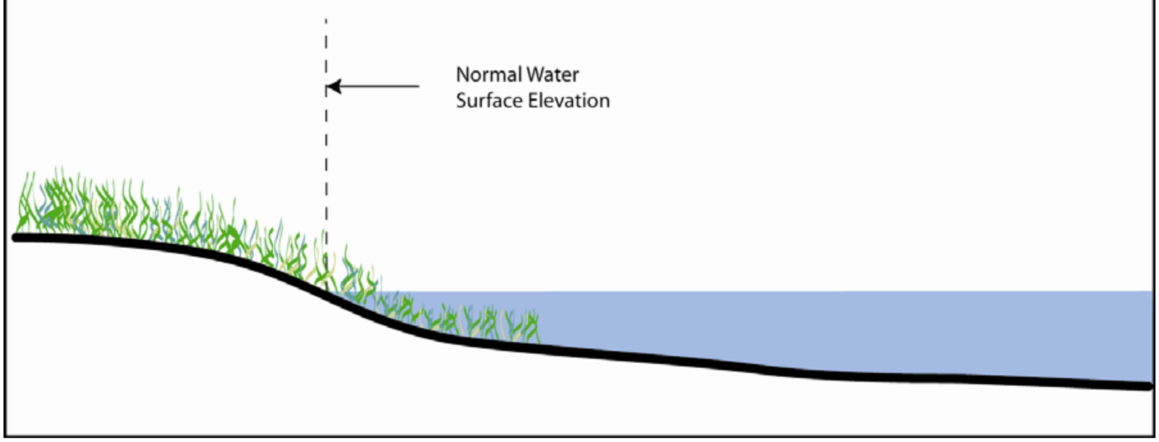
Some regulated waters, especially those with smaller drainage areas, do not have a discernible channel and, therefore, do not have banks from which to measure the riparian zone. In such a case, if the feature is linear (such as a stream), the riparian zone is to be measured outward from the feature's centerline, pursuant to N.J.A.C. 7:13-4.1(b)1. (See Figure 4.4 below.) Note that any feature that meets the definition of a "swale" under the Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A-1.4 is not regulated under the Flood Hazard Area Control Act rules and therefore has neither a flood hazard area nor a riparian zone. This is true because a swale, by definition, drains less than 50 acres and has no bed and banks, and therefore meets the requirements for a non-regulated water under N.J.A.C. 7:13-2.2(a)3.

Figure 4.4



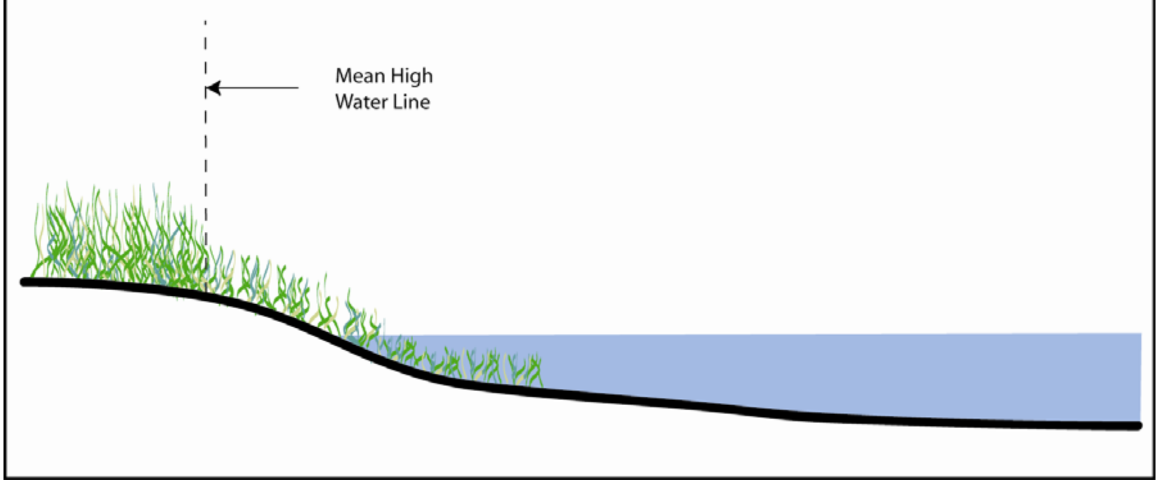
In cases where there is no discernible top of bank along non-linear features in fluvial areas, such as lakes and ponds, the riparian zone is to be measured landward of the normal water surface limit, pursuant to N.J.A.C. 7:13-4.1(b)2. (See Figure 4.5 below.)

Figure 4.5



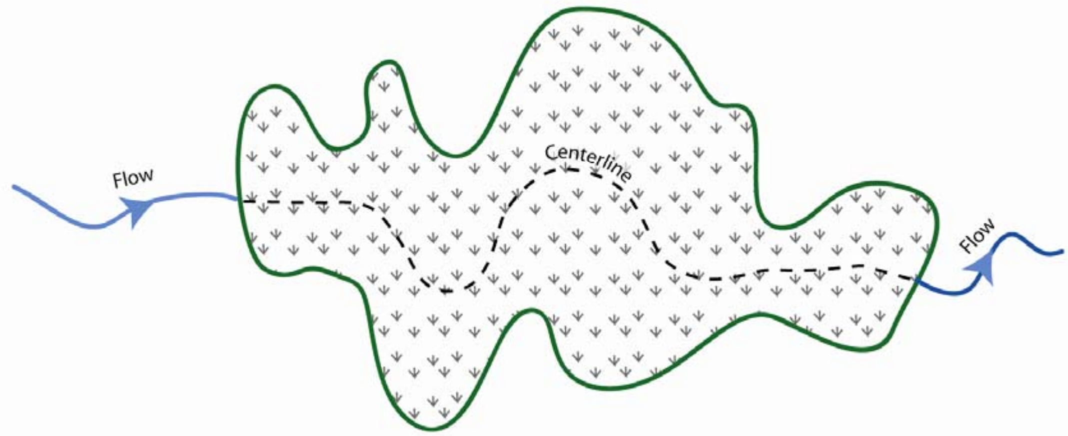
In cases where there is no discernible top of bank along non-linear features in tidal areas, such as bays and inlets, the riparian zone is to be measured landward of the mean high water line, pursuant to N.J.A.C. 7:13-4.1(b)3. (See Figure 4.6 below.)

Figure 4.6



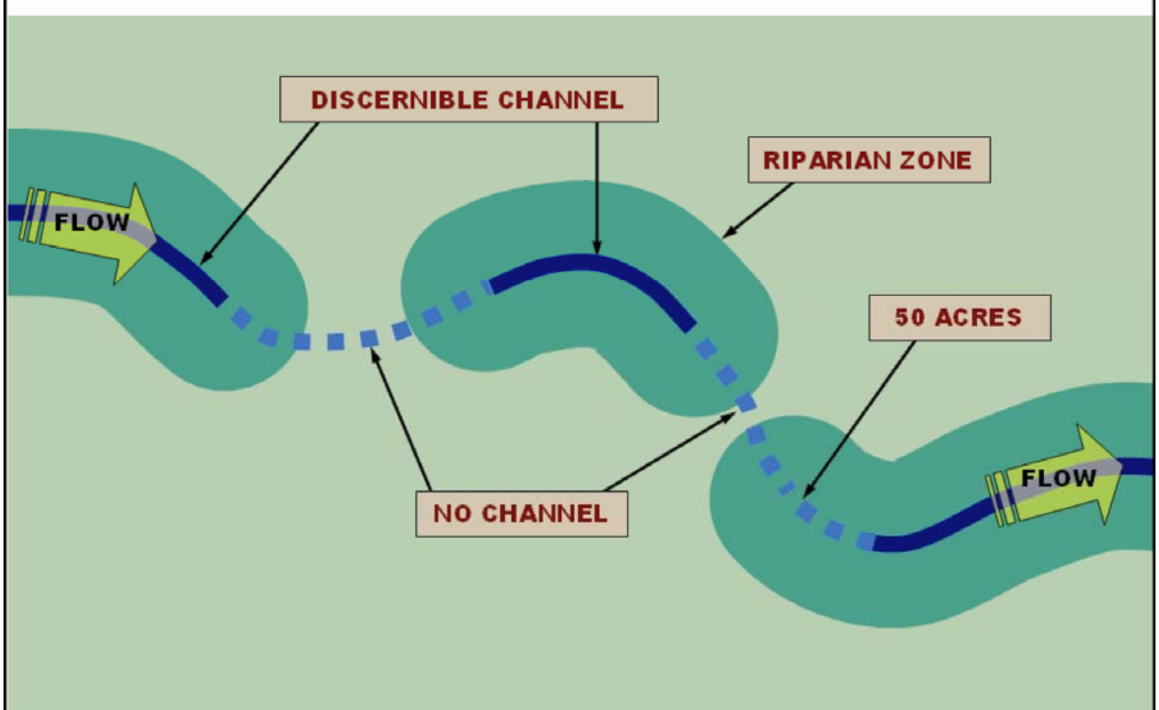
A regulated water may also flow through a wetlands complex, whether fluvial or tidal, and lose a discernible channel. Along such amorphously-shaped features, the riparian zone is to be measured landward of the feature's centerline, pursuant to N.J.A.C. 7:13-4.1(b)4, which is consistent with the Department's application of the special water resource protection area under the Stormwater Management rules. (See Figure 4.7 below.)

Figure 4.7



As noted previously, N.J.A.C. 7:13-2.2(a)3i provides that a feature that drains less than 50 acres, which does not posses a discernible channel, is not regulated under the Flood Hazard Area Control Act rules.

Figure 4.8

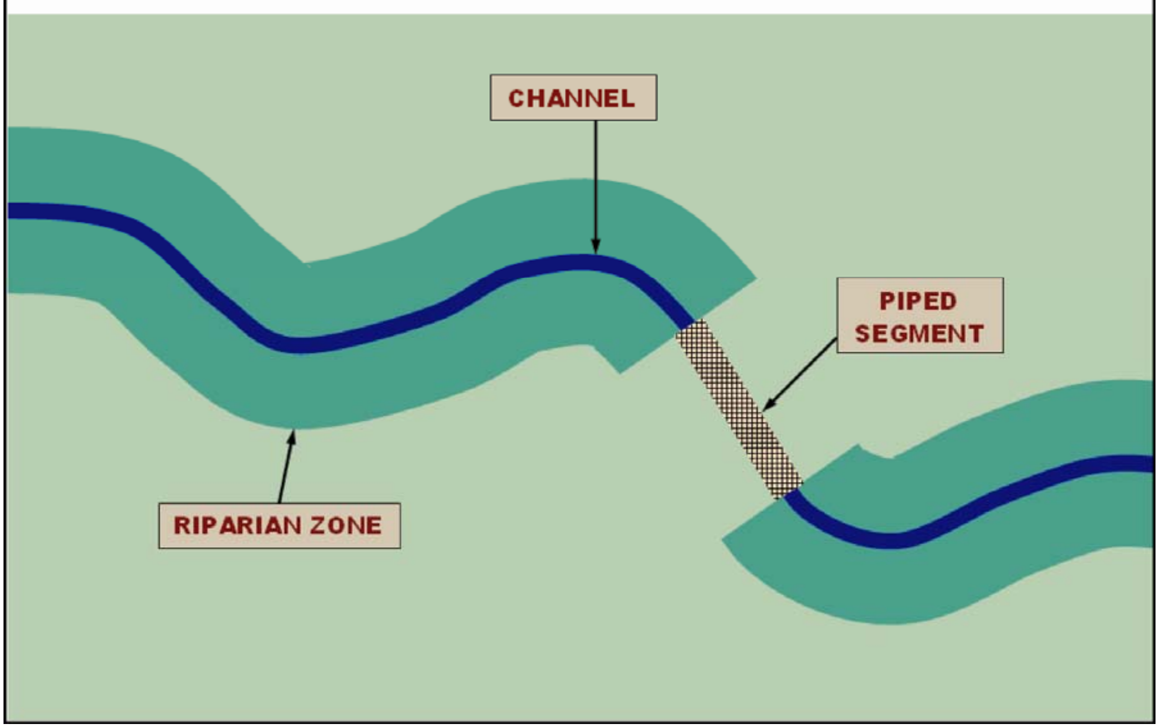


However, in some cases, a feature that drains less than 50 acres may possess a discernible channel only for a particular reach and not possess a discernible channel for another reach. In such a case, only the portions of the feature that possess a discernible channel would be a regulated water, pursuant to N.J.A.C. 7:13-2.2. Since the riparian zone would only exist around the portions of the water that are regulated by the Flood Hazard Area Control Act rules, the riparian zone would appear as shown in Figure 4.8 above. Note that the riparian zone lies along (and arcs around) the segments of the feature that posses a discernible channel.

Note also that once the feature drains at least 50 acres, the feature becomes regulated regardless of whether it possesses a discernible channel. This occurs because N.J.A.C. 7:13-2.2(a)3 exempts from regulation only certain features that drain less then 50 acres. A feature that drains 50 acres or more is therefore always regulated under the Flood Hazard Area Control Act rules, and therefore always possesses a riparian zone, except in the following cases:

- There is no riparian zone along piped sections of an otherwise regulated water. As illustrated in Figure 4.9 above, the riparian zone does not arc around the open channel portion of a regulated water when the channel ends at a pipe. (Note: this is not stated in the Flood Hazard Area Control Act rules but is addressed in the response to comments 347 and 348 in the adoption of these rules at 39 N.J.R. 4620).

Figure 4.9



- Neither manmade canals nor coastal wetlands are regulated under the Flood Hazard Area Control Act rules, pursuant to N.J.A.C. 7:13-2.2(a)1 and 2, respectively. As such, there is no flood hazard area or riparian zone along such features.
- N.J.A.C. 7:13-2.3(a)2 provides that there is no riparian zone along the Atlantic Ocean nor along any manmade lagoon, stormwater management basin, or oceanfront barrier island, spit or peninsula.

4.4 Determining the Width of the Riparian Zone

As noted in the beginning of this section, the riparian zone is the land and vegetation both within a regulated water and within either 50 feet, 150 feet or 300 feet from the top of bank of a regulated water. The Department can make a determination of the extent of the riparian zone on a project site under the issuance of a flood hazard area verification pursuant to the provisions of N.J.A.C. 7:13-6. For more information on verifications, please refer to Section 9.2 of this technical manual.

4.4.1 The 300 Foot Riparian Zone

The riparian zone is 300 feet wide along both sides of any Category One water and all upstream tributaries situated within the same HUC-14 sub-watershed as the Category One water. As noted above in section 4.2, the 300-foot riparian zone applies along all regulated Category One waters under the Flood Hazard Area Control Act rules, whereas the Special Water Resource Protection Area under the Stormwater Management rules applies only along surface water features that are shown on USGS Quadrangle Maps or County Soil Surveys, and only if a project meets the definition of a major development in the Stormwater Management rules. Since many small tributaries regulated under the Flood Hazard Area Control Act rules are not shown on USGS Quadrangle Maps or in County Soil Surveys, and as the Flood Hazard Area Control Act rules regulates a larger universe of activities than do the Stormwater Management rules, the 300-foot riparian zone applies along a greater number of waters, and impacts a greater number of construction projects, than the 300-foot Special Water Resource Protection Area under the Stormwater Management rules.

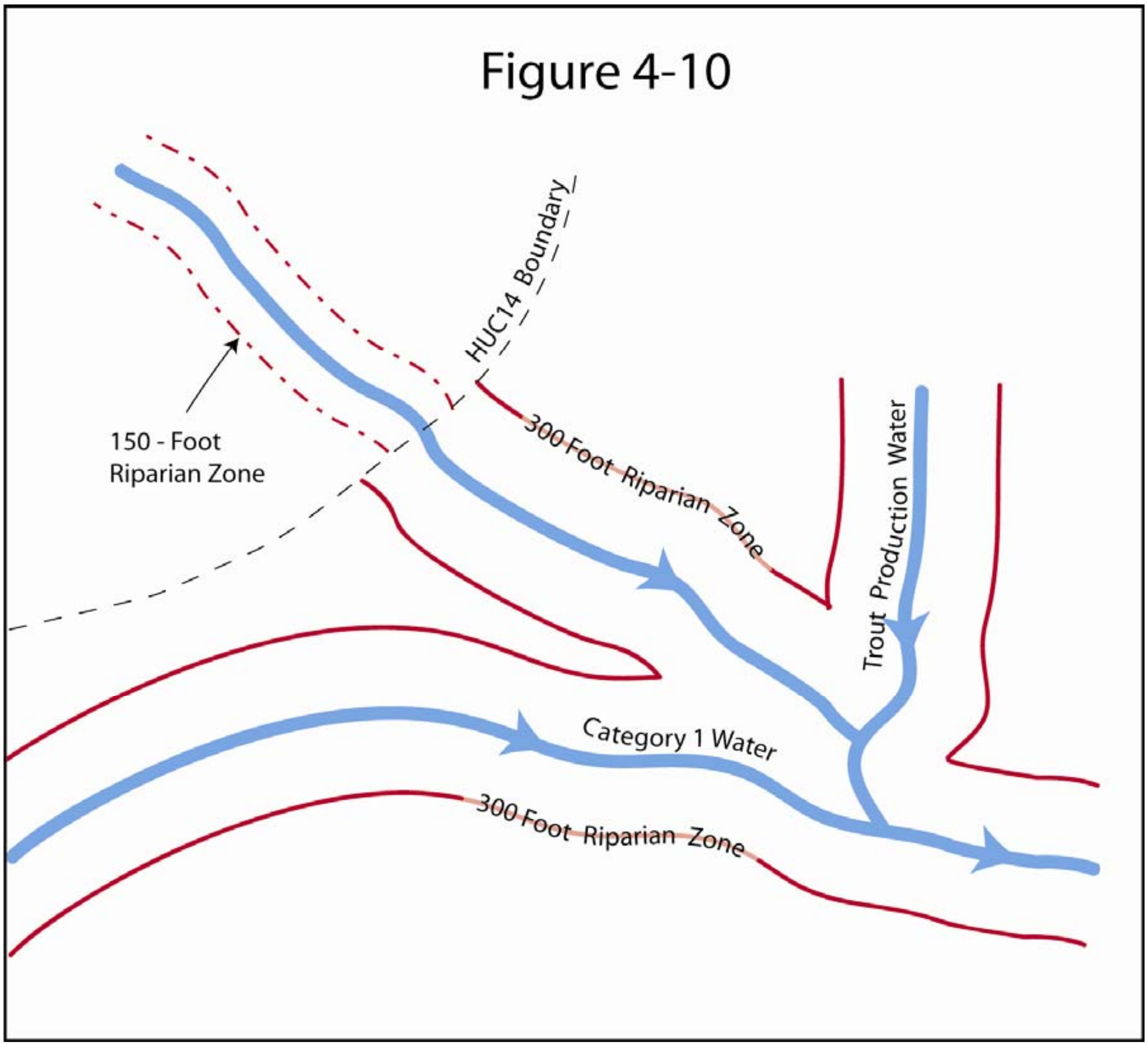
The Department maintains a list of stream classifications within its Surface Water Quality Standards at N.J.A.C. 7:9B, also found at www.state.nj.us/dep/wms. Streams, lakes and reservoirs that have been designated as Category One are specifically listed. The Department has developed mapping showing HUC-14 areas and Category One streams, which is available on the Department's interactive mapping tool found at www.state.nj.us/dep/gis/imapnj.htm, to aid in making a determination on whether a project is located in an area of the State where the 300-foot riparian zone might be required under the Stormwater Management rules or the Flood Hazard Area Control Act rules. However, in case of conflict, the listing in the Department's Surface Water Quality Standards govern.

4.4.2 The 150 Foot Riparian Zone

The riparian zone is 150 feet wide along both sides of any waters containing trout resources, certain threatened or endangered species of plant or animal and areas of acid producing soils (unless the regulated water otherwise qualifies for a 300-foot riparian zone under N.J.A.C. 7:13-4.1(c)1).

Trout Production Waters

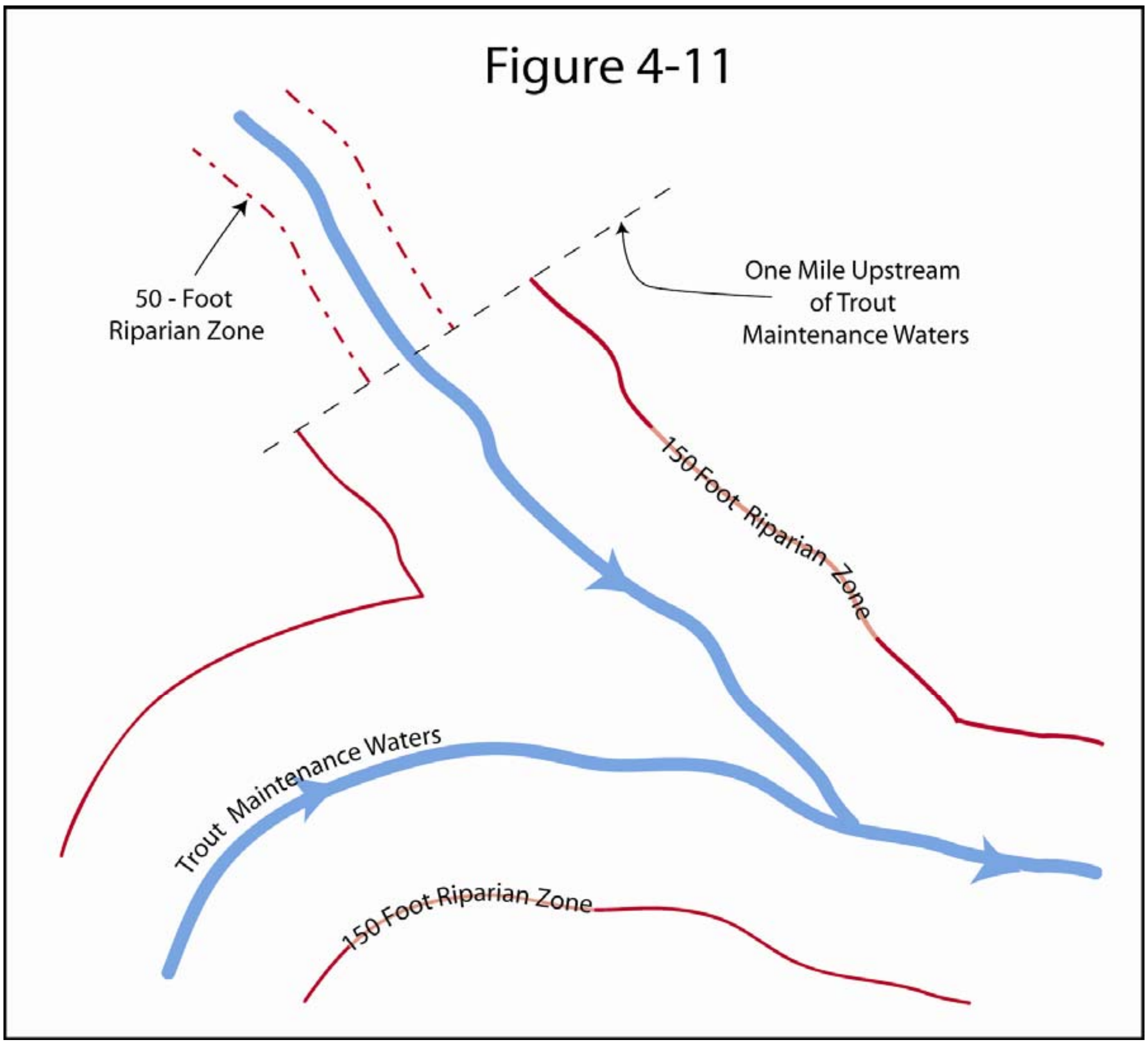
The Flood Hazard Area Control Act rules at N.J.A.C. 7:13-4.1(c)2i establish a 150-foot riparian zone along trout production waters and all upstream waters (including tributaries) as shown in Figure 4.10 below.



Most trout production waters in the State are also designated as Category One waters. Since Category One waters and tributaries within the same HUC-14 watershed receive a 300-foot riparian zone under N.J.A.C. 7:13-4.1(c)1, the 300-foot riparian zone would govern in cases where a trout production water is also a Category One water. However, any tributary to a trout production water (outside the HUC-14 boundary of the Category One designation) would receive a 150-foot riparian zone up to its source.

Trout Maintenance Waters

N.J.A.C. 7:13-4.1(c)2ii provides that the riparian zone is 150 feet wide along both sides of any trout maintenance water and all upstream waters (including tributaries) within one linear mile as measured along the length of the regulated water. Thus, the one mile upstream follows the sinuosity of the stream and its tributaries, and not in a straight line. (See Figure 4.11 below.)

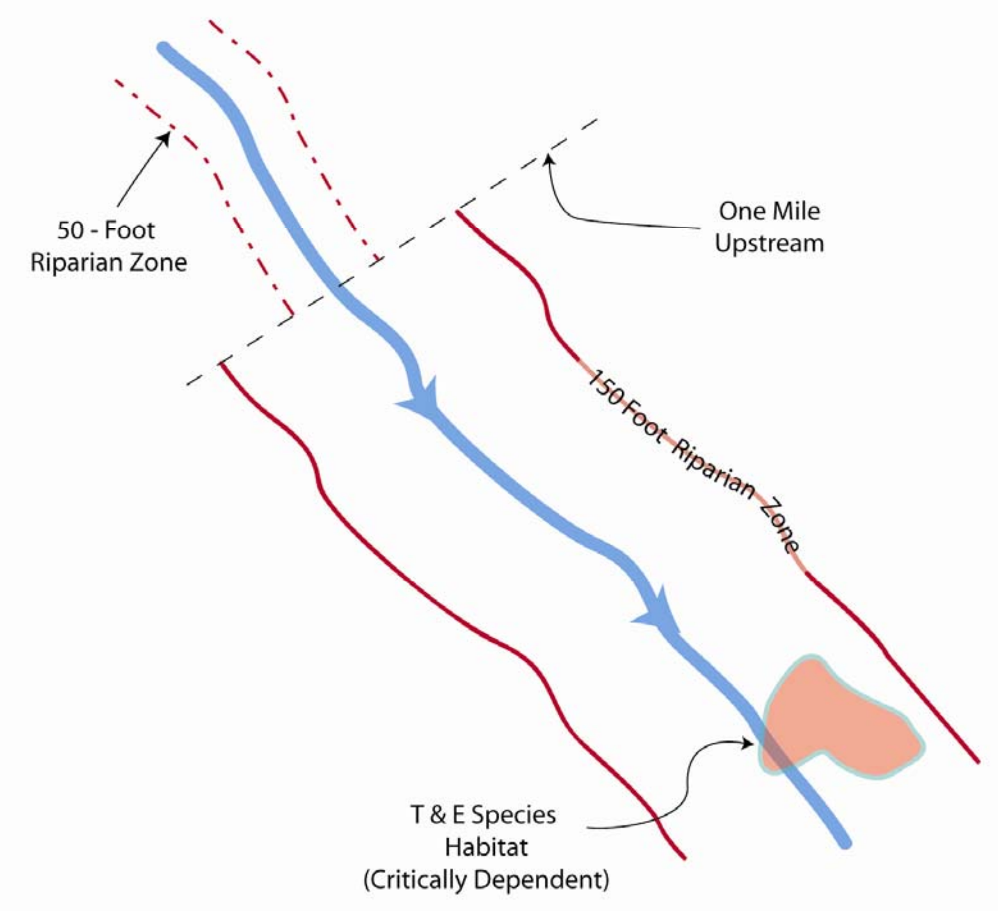


Threatened and Endangered Species

Under N.J.A.C. 7:13-4.1(c)2iii, the 150-foot riparian zone also applies to any segment of regulated waters flowing through an area that contains documented habitat for a threatened or endangered species of plant or animal, which is critically dependent on the regulated water for survival, and all upstream waters (including tributaries) within one linear mile. Just like trout maintenance waters, the one mile upstream is measured by stream miles, following the sinuosity of the stream and its tributaries, and not a straight line. (See Figure 4.12 below.)

The List of Threatened and Endangered Species that are Critically Dependent on Regulated Waters for Survival can be found at the Division of Land Use Regulation's website at www.state.nj.us/dep/landuse as well as Appendix 2 of this manual.

Figure 4-12



It should be noted that while only those species that are critically dependent on regulated waters for survival will result in a 150-foot riparian zone, N.J.A.C. 7:13-10.6(d) requires that an individual permit can be issued for a regulated activity in a flood hazard area or riparian zone only if the activity will not adversely affect any threatened or endangered species or any documented habitat for a threatened or endangered species. N.J.A.C. 7:13-8.1(b)3 contains a similar provision for general permits. So while only some species will cause the riparian zone to be 150 feet wide, all threatened and endangered species within the jurisdiction of the Flood Hazard Area Control Act rules are protected.

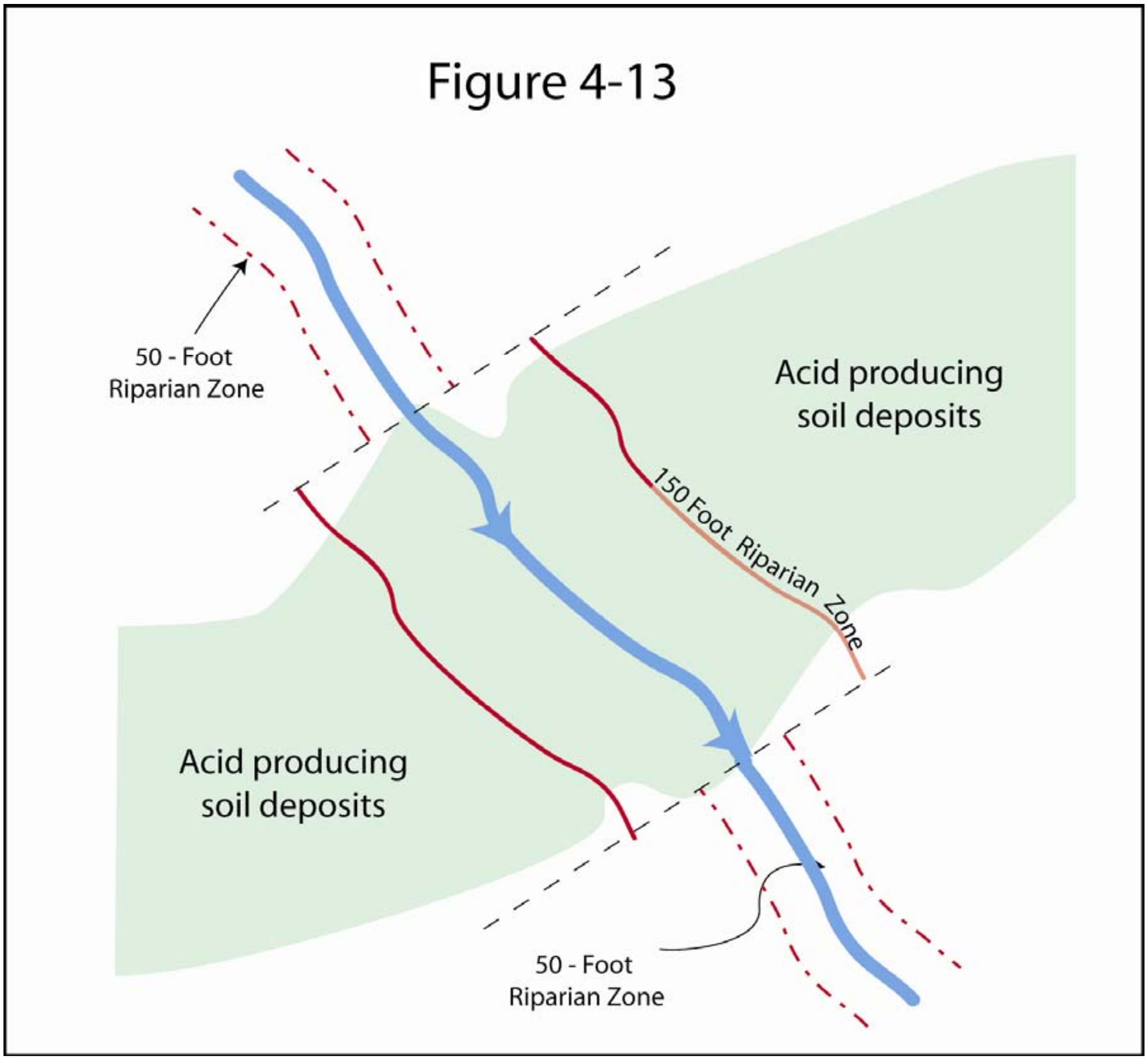
For example, bog turtle is listed as a species that is critically dependent on regulated waters for survival. As such, any regulated water that supports bog turtle habitat (and any regulated water one mile upstream) will have a 150-foot riparian zone (provided the water is not Category One, in which case the riparian zone would be 300 feet). In contrast, bald eagle is not a listed as a species that is critically dependent on regulated waters for survival. The presence of bald eagle habitat would not, therefore, cause the riparian zone to be 150 feet wide. However, both the bog turtle habitat and the bald eagle habitat would be protected in the flood hazard area and the riparian zone under N.J.A.C. 7:13-8.1(b)3 and 10.6(d). The bog turtle habitat causes the riparian zone to be wider than in the area where the bald eagle habitat is located, but both habitats are protected if they lie within the flood hazard area or riparian zone. For more information on threatened or endangered species, please refer to section 6 of this manual.

Acid Producing Soils

The Flood Hazard Area Control Act rules apply a 150-foot riparian zone along waters under N.J.A.C. 7:13-4.1(c)2iv in order to prevent the degradation of water quality and the riparian zone due to exposure to acid. (See Figure 4.13 below.)

Unlike the application of the 150-foot riparian zone along trout waters and waters containing documented habitat for a threatened or endangered species of plant or animal critically dependent on the regulated water for survival, this application of the riparian zone is designed to protect the regulated water, regardless of its overall classifications or condition. This application of the 150-foot riparian zone recognizes the impact that certain activities, which have the potential to expose acid producing soils, have on the aquatic ecosystem.

A map showing the location of acid producing soil can be found in the “Standards for Soil Erosion and Sediment Control in New Jersey” and is included in section 7 of this manual. The publication “Standards for Soil Erosion and Sediment Control in New Jersey”, is available for order through one of the 15 local Soil Conservation District offices that are located throughout New Jersey. In addition, a map showing geologic formations for the state can be found at the Department's I-Map NJ Geology. For more information on determining the location of acid producing soils, please refer to Section 7 of this manual.



4.4.3 The 50 Foot Riparian Zone

The Flood Hazard Area Control Act rules at N.J.A.C. 7:13-4.1(c)3 establishes a 50-foot riparian zone along all waters not identified as having a 300-foot riparian zone or a 150-foot riparian zone.

4.5 Other Riparian Zones and Buffers

The Flood Hazard Area Control Act rules at N.J.A.C. 7:13-4.1(d) clarify that in addition to the riparian zones in this rule, other Department rules also protect near-stream areas. Projects subject to other rules must meet any applicable buffer requirements as well as the riparian zone requirements under this rule. For example, the Stormwater Management rules at N.J.A.C. 7:8 and the Highlands Water Protection and Planning Act rules at N.J.A.C. 7:38 both establish 300-foot buffers adjacent to certain waters under certain circumstances. The Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A furthermore establish 50-foot and 150-foot transition areas along certain freshwater wetlands and other features that may also be regulated under the Flood Hazard Area Control Act rules. Accordingly, the Flood Hazard Area Control Act rules make it clear that projects must comply with any applicable similar buffer requirements that may be imposed at the Federal, State and/or local levels.

4.6 Riparian Zones in Tidal Areas

The vegetation, topography, landscape and development typical along the Atlantic Ocean and along any manmade lagoon or oceanfront barrier island, spit or peninsula are significantly different from other riparian areas in the State. Existing coastal policies that protect these unique tidal landforms, as well as other policies specific to the beach areas, recognize the types of impacts that are specific to these areas and therefore provide adequate protection to vegetation along these tidal waters. However, work along all other tidal waters (that are regulated waters in accordance with the Flood Hazard Area Control Act rules) may also trigger review under the Coastal Permit Program rules (N.J.A.C. 7:7) and the Coastal Zone Management rules (N.J.A.C. 7:7E).

Under N.J.A.C. 7:13-2.1(b)5, obtaining a CAFRA or waterfront development permit for a regulated activity will satisfy the requirements of the Flood Hazard Area Control Act rules. This is appropriate since the coastal rules cited above have incorporated by reference all of the design and construction standards of the Flood Hazard Area Control Act rules. Therefore, prior to issuing any CAFRA or waterfront development permit in a flood hazard area or riparian zone, the Department will first determine if the activity meets the requirements of the Flood Hazard Area Control Act rules, as well as the Coastal Permit Program rules (N.J.A.C. 7:7) and the Coastal Zone Management rules (N.J.A.C. 7:7E). Thus, if you obtain a CAFRA or waterfront development permit for an activity, you do not need a separate flood hazard area permit for that activity.

Note that N.J.A.C. 7:7E-3.26 of the Coastal Zone Management rules establishes a riparian zone adjacent to regulated waters under the Flood Hazard Area Control Act and rules. Therefore, riparian zone under the coastal rules are equal to the riparian zone under the Flood Hazard Area Control Act rules. N.J.A.C. 7:7E-3.26(f) also provides that if endangered and/or threatened wildlife or plant species habitat is present in the riparian zone such that the area is also an endangered or threatened wildlife or plant species habitat special area in accordance with N.J.A.C. 7:7E-3.38, then the requirements of N.J.A.C. 7:7E-3.38 regarding the protection of the habitat shall apply.

4.7 Requirements for a Regulated Activity in the Riparian Zone

The riparian zone is a distinct regulated area and, as such, any activity located within it is subject to the jurisdiction of the Flood Hazard Area Control Act rules (see N.J.A.C. 7:13-2.4). A number of permits-by-rule have been established at N.J.A.C. 7:13-7.2, under which many minor disturbances to riparian zone vegetation are approved. For example, the permit-by-rule at N.J.A.C. 7:13-7.2(a)2 allows any number of activities in a previously disturbed riparian zone, provided a handful of criteria are met. The permits-by-rule have been designed to be relatively lenient in cases where previous disturbance to vegetation has occurred. However, if riparian zone disturbance exceeds the limitations of a permit-by-rule, an applicant must obtain a general permit under N.J.A.C. 7:13-8 or an individual permit under N.J.A.C. 7:13-9, 10 and 11.

Some of the general permits at N.J.A.C. 7:13-8 include limitations on the amount of riparian zone disturbance that can occur in order to qualify for a general permit authorization. In particular, general permits 7 though 10 reference the requirements for riparian zone disturbance under N.J.A.C. 7:13-10.2, which also applies to all individual permit applications.

N.J.A.C. 7:13-10.2 sets forth requirements that must be met for the issuance of an individual permit for any regulated activity located in a riparian zone, as well as the general permits mentioned above. The activity-specific requirements in this section are in addition to any other requirements applicable to general permit and individual permits. The rules also include a number of specific limits and requirements for acceptable uses in the riparian zone. In order for a proposed activity that results in the clearing, cutting or removal of vegetation in a riparian zone to be approved, it must satisfy the following three requirements:

1. It must meet the general conditions for all riparian zone disturbance at N.J.A.C. 7:13-10.2(d);
2. It cannot exceed the limitations on the area of disturbance under Table C, except as provided under N.J.A.C. 7:13-10.2(f)1, (i)2 and (o); and
3. It must meet any special conditions that may apply to he proposed activity under N.J.A.C. 7:13-10.2(e) through (r).

N.J.A.C. 7:13-10.2(d) includes four requirements that must be met in order for the Department to permit a regulated activity within a riparian zone. N.J.A.C. 7:13-10.2(d) also introduces Table C, which sets forth the maximum area of vegetation that can be disturbed within the riparian zone for a number of specific activities discussed in N.J.A.C. 7:13-10.2(e) through (r). N.J.A.C. 7:13-10.2(d), therefore, lists the basic criteria for any regulated activity within a riparian zone, while N.J.A.C. 7:13-10.2(e) through (r) place additional restrictions for various projects.

N.J.A.C. 7:13-10.2(d)1 provides that, in order for the Department to allow a regulated activity to be conducted within a riparian zone, it must be determined that the basic purpose of the project cannot be accomplished onsite without disturbing riparian zone vegetation. The intent of this provision is to prevent unnecessary disturbance to such vegetation.

If a regulated activity can be conducted outside a riparian zone and still serve its intended purpose and function, then the activity must be conducted outside the riparian zone. Some projects cannot serve their basic purpose or function outside the riparian zone. For example, a roadway constructed across a stream in order to reach an otherwise inaccessible piece of land on the other side must necessarily cross through the riparian zone. The area of disturbance can be minimized by carefully configuring the roadway's location or width, but the basic purpose of the project cannot be accomplished without loss of riparian zone vegetation.

Some activities are water dependent and therefore must access the edge of water or the channel. A boat ramp, fishing pier or public access to the water, for example, could not possibly be constructed outside a riparian zone. Conversely, the basic purpose of a house is to provide habitation for humans, a function served equally well within or outside a riparian zone. On a vacant lot there may be several potential locations to construct a new house. If on a given site there exists a viable location outside a riparian zone where a house can be built, then N.J.A.C. 7:13-10.2(d)1 prevents the construction of a new house within the riparian zone on that site. However, if all or a large portion of a site lies within a riparian zone such that any house constructed on that site would necessarily impact the riparian zone, N.J.A.C. 7:13-10.2(m) permits the construction of the house within the riparian zone since there is no alternative location onsite that would avoid disturbing the riparian zone.

N.J.A.C. 7:13-10.2(d)2 requires that, in order for the Department to allow a regulated activity to be conducted within a riparian zone, it must be determined that disturbance is eliminated where possible and, where it is not possible, disturbance in the riparian zone is minimized. To determine whether this criterion is satisfied, the Department will examine various alternatives, including relocating the project and/or reducing the size or scope of the project, as well as situating the project in portions of the riparian zone where previous development or disturbance has occurred. The Department does not intend to require every applicant to prepare an exhaustive alternative analysis. However, the Department will evaluate each project to determine whether another reasonable location on site or configuration is available that would minimize or eliminate disturbance to the riparian zone.

N.J.A.C. 7:13-10.2(d)3 provides that the Department will allow a regulated activity to be conducted within a riparian zone only if all temporarily disturbed areas in the riparian zone are replanted with indigenous, non-invasive vegetation upon completion of the project. The acceptable method for accomplishing this is discussed in N.J.A.C. 7:13-10.2(u). The Department recognizes that some disturbance within the riparian zone is of a temporary nature and therefore establishes the requirement to restore such disturbed areas.

N.J.A.C. 7:13-10.2(d)4 explains that a given project proposed within a riparian zone may be subject to additional requirements and limitations that are found elsewhere in the chapter. An example is given of a flood control project. While both Table C and N.J.A.C. 7:13-10.2(o) set forth the basic parameters and upper limits on disturbance to vegetation in the riparian zone for flood control projects, N.J.A.C. 7:13-11.12 includes additional requirements that must be considered specifically for such projects. Therefore, it should not be assumed that the full amount of disturbance allowed under this section is always warranted or will be allowed for a given project. Table C (reprinted below) merely sets forth the basic parameters and upper limits on disturbance to vegetation in the riparian zone.

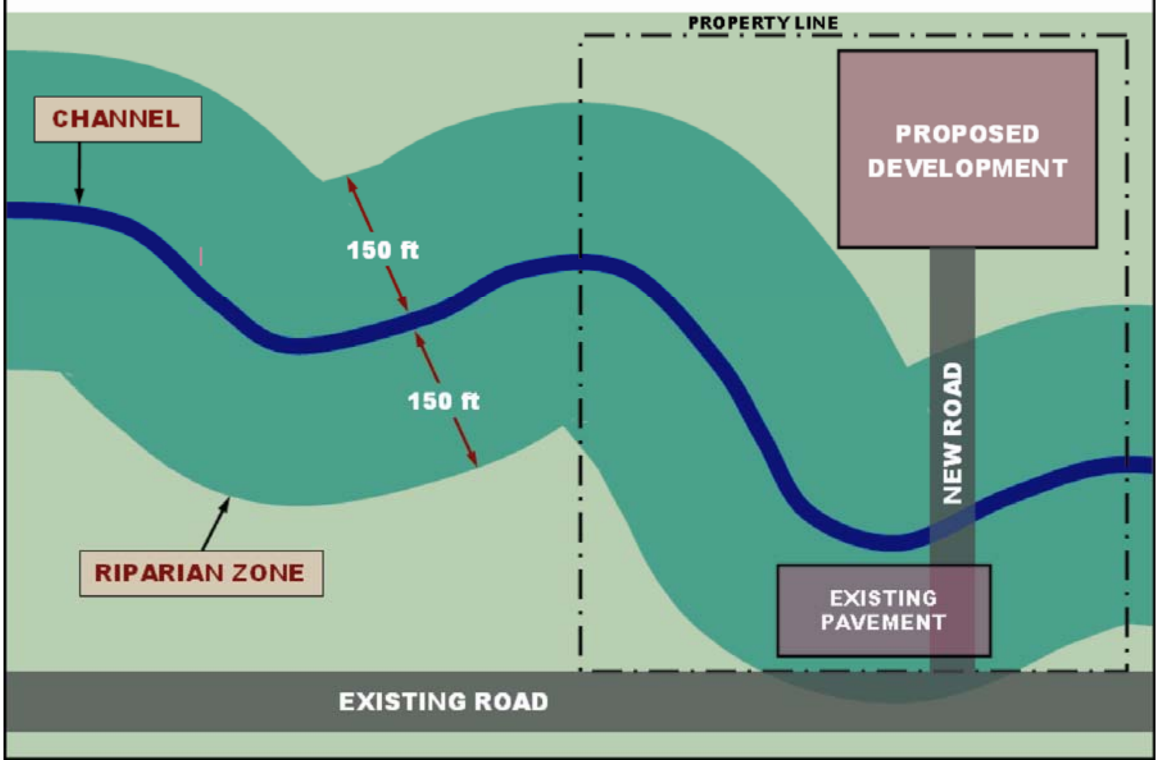
MAXIMUM ALLOWABLE DISTURBANCE TO RIPARIAN ZONE VEGETATION

Proposed Regulated Activity		See Paragraph Below for Further Detail	Maximum Area of Vegetation Disturbance Based on the Width of the Riparian Zone		
			50-foot Riparian Zone	150-foot Riparian Zone	300-foot Riparian Zone
• Railroad or public roadway					
New	Crossing a water	(e)	5,000 ft^2	15,000 ft^2	30,000 ft^2
	Not crossing a water		2,000 ft^2	6,000 ft^2	12,000 ft^2
Reconstructed	Crossing a water	(f)	2,500 ft^2	7,500 ft^2	15,000 ft^2
	Not crossing a water		1,000 ft^2	3,000 ft^2	6,000 ft^2
• Private roadway that serves as a driveway to one private residence					
New	Crossing a water	(g)	1,500 ft^2	4,500 ft^2	9,000 ft^2
	Not crossing a water		600 ft^2	1,800 ft^2	3,600 ft^2
Reconstructed	Crossing a water	(h)	750 ft^2	2,250 ft^2	4,500 ft^2
	Not crossing a water		300 ft^2	900 ft^2	1,800 ft^2
• All other private roadways					
New	Crossing a water	(g)	3,000 ft^2	9,000 ft^2	18,000 ft^2
	Not crossing a water		1,200 ft^2	3,600 ft^2	7,200 ft^2
Reconstructed	Crossing a water	(h)	1,500 ft^2	4,500 ft^2	9,000 ft^2
	Not crossing a water		600 ft^2	1,800 ft^2	3,600 ft^2
• Bank stabilization or channel restoration					
Accomplished with vegetation alone		(i)	No limit if disturbance is justified		
Other permanent disturbance			2,000 ft^2	2,000 ft^2	2,000 ft^2
Other temporary disturbance			1,000 ft^2	3,000 ft^2	6,000 ft^2
• Stormwater discharge (including pipe and conduit outlet protection)					
Permanent disturbance		(j)	1,000 ft^2	1,000 ft^2	1,000 ft^2
Temporary disturbance			1,000 ft^2	3,000 ft^2	6,000 ft^2
• Utility line (temporary disturbance only)					
Crossing a water		(k)	2,000 ft^2	6,000 ft^2	12,000 ft^2
Not crossing a water		(l)	800 ft^2	2,400 ft^2	4,800 ft^2
• Other projects					
Private residence		(m)	2,500 ft^2	5,000 ft^2	5,000 ft^2
Addition, garage, barn or shed		(n)	1,000 ft^2	2,000 ft^2	2,000 ft^2
Flood control project		(o)	3,000 ft^2	9,000 ft^2	18,000 ft^2
Public accessway or public access area		(p)	No limit if disturbance is justified		
Water dependent development		(q)	No limit if disturbance is justified		
All other regulated activities		(r)	1,000 ft^2	3,000 ft^2	6,000 ft^2

The values shown in Table C represent the upper-limit of disturbance that the Department believes is reasonably required to accomplish the various activities listed in the table. It should be remembered that the values contained in Table C represent the maximum allowable disturbance for a given activity and that all disturbances must first be justified and minimized under N.J.A.C. 7:13-10.2(d).

Example: An applicant proposes to construct a private roadway across a stream to service a new commercial facility under a flood hazard area individual permit. The stream in question has a 150-foot riparian zone. The total area of disturbance within the riparian zone to construct the roadway is 10,500 ft^2. However approximately 2,000 ft^2 of the roadway will be constructed on top of lawfully existing pavement. (See Figure 4.14 below)

Figure 4.14



Step 1: As with all riparian zone disturbance, the applicant must first demonstrate that the proposed roadway meets the requirements of N.J.A.C. 7:13-10.2(d).

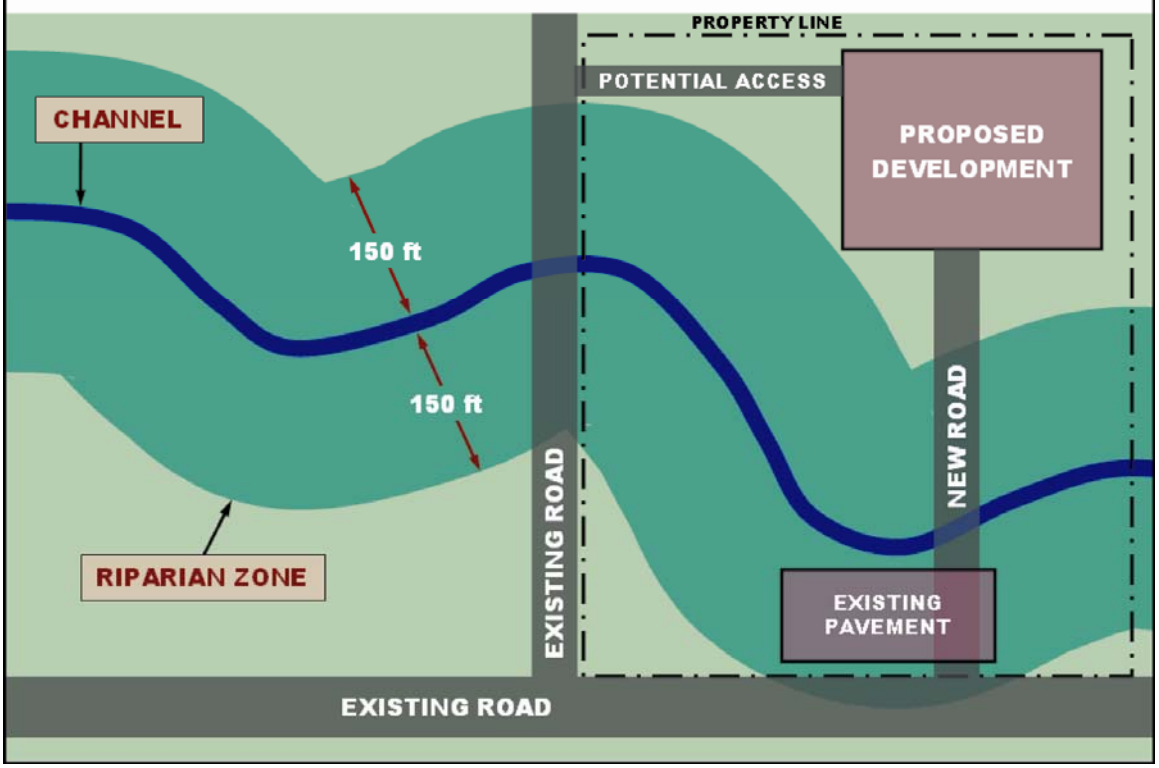
Step 2: According to Table C, the maximum allowable disturbance to riparian zone vegetation for a private roadway that crosses a water in a 150-foot riparian zone is 9,000 ft^2. As noted above, the total area of disturbance within the riparian zone to construct the roadway is 10,500 ft^2, but 2,000 ft^2 of the roadway will be constructed on top of existing pavement. Therefore, the total amount of vegetation that will be removed in the riparian zone for the construction of the roadway is 8,500 ft^2. The 2,000 ft^2 of the roadway that will be constructed on top of an existing asphalt parking lot does not count toward the maximum allowable disturbance because the area is already devoid of vegetation. Therefore, the limitations of Table C are met.

Step 3: The second column of Table C explains that applicants should "See Paragraph Below for Further Detail" for each proposed activity. In this case, applicants are referred to paragraph (g), which indicates that there are additional requirements that must be satisfied for this activity under N.J.A.C. 7:13-10.2(g). These requirements are as follows:

1. The total area of vegetation cleared, cut and/or removed within the riparian zone does not exceed the limits set forth in Table C above;
2. The width of the roadway is minimized;
3. Any crossing of a regulated water is designed and constructed as nearly perpendicular to the channel as possible;
4. The roadway accesses a lot that did not receive preliminary or final subdivision approval after October 2, 2006;
5. If the roadway does not cross a regulated water, but impacts a 150-foot or 300-foot riparian zone, the applicant demonstrates that there is no other means of constructing a roadway to access the developable area onsite, which would reduce or eliminate the impact to the riparian zone; and
6. If the roadway crosses a regulated water that has a 150-foot or 300-foot riparian zone, the applicant demonstrates that there is developable land onsite that cannot feasibly be accessed without crossing the water, including accessing the site through neighboring properties.

The applicant must therefore demonstrate that each of these six requirements has been satisfied. The first requirement has already been satisfied as noted in Step 2 above. The second requirement should not be difficult to prove if the applicant cites local requirements for the width of a roadway accessing this type of development and the resultant amount of clearing that must be done to accommodate the construction of the roadway. If the Department determines, however, that the proposed roadway is wider than actually needed, this requirement could be used to make the applicant reduce the width of the roadway in order to preserve riparian zone vegetation. The third requirement appears to be met given the location of the existing roadway and existing pavement, the property boundary, the location of the developable land on site, and the fact that the roadway is not constructed at a significant skew. The forth requirement can be demonstrated by showing the Department when the lot was created. The fifth requirement applies only to roads that do not cross a regulated water, and so this requirement does not apply to this project. Under the sixth requirement, the applicant must show that there is no other feasible way to reach the developable land onsite. If another way to reach the developable land already exists (such as an existing stream crossing onsite or another roadway that adjoins that portion of the property), then this requirement would not be satisfied. Therefore, in order to demonstrate that this requirement is met, the applicant should explain whether any such access already exists, and also whether neighboring property owners would be willing to sell an easement to construct an access that would not need to cross the stream. For example, if a roadway also happened to exist along the left property boundary of the site (as shown in Figure 4.15 below), the Department would likely conclude that there is another means of accessing the developable land onsite that would not require a new stream crossing. If the Department made such a determination, the project would not likely receive a flood hazard area individual permit for a new roadway across this stream.

Figure 4.15



4.8 Temporary and Permanent Disturbance in the Riparian Zone

The Flood Hazard Area Control Act rules at N.J.A.C. 7:13-10.2(c)3 require that all temporary and permanent disturbances to riparian zone vegetation be included when applying the maximum limits of disturbance under Table C. This is appropriate in many cases, since certain types of vegetation (such as forested areas) cannot be easily restored to their original condition after "temporary" disturbance has occurred.

However, in some cases, a maintained lawn or garden may need to be temporarily disturbed to accommodate a nearby construction activity and/or to facilitate the construction or repair of something below ground. In other cases, an area of maintained lawn or garden may be permanently disturbed to accommodate an activity, but an equal or greater area of lawn or garden will be created within the riparian zone along the same stream to compensate. Examples of such disturbances may include:

- The construction or repair of a septic system
- The remediation of contaminated soil
- The placement of an underground utility line
- The relocation or improvement of trails, footbridges and other features within a park or golf course

In such cases where a lawn or garden area will be temporarily disturbed to accommodate a proposed construction activity, the disturbed area can be quickly and easily restored to its original condition, and no adverse environmental impact will occur. Similarly, when an area of maintained lawn or garden is permanently disturbed to accommodate a construction activity, but an equal or greater area of lawn or garden will be created within the same riparian zone onsite to compensate, there is no need to limit the disturbance of such areas, provided all other requirements of the rules are met.

Given the above, temporarily disturbed lawn or garden areas within riparian zones do not count toward the maximum allowable limits in Table C, provided the disturbed area is restored to its original condition. Furthermore, in cases where permanent disturbance to lawn or garden areas does occur, but an equal or greater area of lawn or garden will be created within the riparian zone onsite along the same stream to compensate, the total net disturbance to such areas shall count toward the maximum allowable limits in Table C.

Example 1: A person intends to repair a failing septic system, which will result in 3,000 ft^2 of temporary riparian zone disturbance. Of this area, 2,000 ft^2 is a maintained lawn and 1,000 ft^2 is forested. Upon completion of the project, the entire 3,000 ft^2 shall become lawn. In such a case, the 2,000 ft^2 of disturbed lawn can be ignored, since it will be fully restored upon completion of the project. The 1,000 ft^2 of disturbed forest, however, must comply with the requirements of N.J.A.C. 7:13-10.2(r) and be adequately compensated for.

Example 2: The owners of a golf course intend to relocate an existing walkway and footbridge to an area that is currently a maintained lawn along the same stream onsite. The area currently occupied by the walkway and footbridge will be converted to a lawn, and there will be no net loss of lawn area. In such a case, the disturbed lawn area can be ignored since it will be fully compensated for by the creation of new lawn where the walkway and footbridge currently exist. However, should there be a net loss of lawn area, any such loss must comply with the requirements of N.J.A.C. 7:13-10.2(r) and be adequately compensated for.

4.9 Compensation and Restoration for Riparian Zone Disturbance

N.J.A.C. 7:13-10.2(t) sets forth the guidelines for providing 2:1 compensation as referred to in N.J.A.C. 7:13-10.2(f)1, (i)2, (o), (r)4 and (s). In all cases except N.J.A.C. 7:13-10.2(r)4, an applicant is required to replant at least twice the area of all cleared, cut and removed vegetation <u>in excess of</u> the limit in Table C. In the case of N.J.A.C. 7:13-10.2(r)4, an applicant is required to replant at least twice the area of <u>all</u> cleared, cut and removed vegetation.

Requiring 2:1 compensation for disturbed areas is consistent with other similar environmental mitigation standards (such as under the Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A), and is necessary to ensure that the lost resource is adequately mitigated. Replanted areas can take many years to replicate the size and density of the original vegetation that is lost, and survival rates of planted species are usually less than 100 percent. Furthermore, the replanted area is generally not immediately adjacent to the lost vegetation and may be offsite altogether. Requiring 2:1 compensation, therefore, ensures that any adverse impacts that occur due to the loss of riparian zone vegetation will be adequately compensated.

All replanting of vegetation for the purpose of 2:1 compensation must be accomplished as described in N.J.A.C. 7:13-10.2(u), and can be accomplished in one or both of two ways. An applicant can remove lawfully existing structures and/or impervious surfaces in a riparian zone and replant that area with vegetation. An applicant can also plant new trees in a riparian zone in an area that is largely devoid of trees, provided any trees originally situated onsite were lawfully removed. Replanting vegetation removed in violation of this chapter does not qualify as adequate riparian zone compensation.

The area selected for replanting must also be deed restricted against future development that would remove the compensatory vegetation. It is the Department's experience that the two methods described in this subsection are acceptable means of restoring the lost value of riparian zones. An applicant can choose to perform one or both of these methods to reach the total area of compensation required. Compensation could, therefore, consist solely of one method or could be a combination of two methods at the discretion of the applicant, provided the standards at N.J.A.C. 7:13-10.2(u) are satisfied as noted below:

- All replanting shall be in the riparian zone of the same regulated water as the cleared, cut or removed vegetation

- All replanting shall be as close to the cleared, cut or removed vegetation as possible

- All replanting shall be of indigenous, non-invasive vegetation

- The replanted vegetation shall be of equal or greater density as the cleared, cut or removed vegetation

- The applicant shall monitor and maintain replanted vegetation for at least three growing seasons to ensure proper establishment and survival

- The location, nature, area and schedule for replanted vegetation shall be shown on drawings submitted with the application for the individual permit that necessitates the replanting. No replanting required under this section shall commence without the prior approval of the Department.

4.10 Redevelopment in the Riparian Zone

N.J.A.C. 7:13-10.2(v) sets forth requirements for certain redevelopment activities within the riparian zone. In cases where an applicant proposes to redevelop a site within 25 feet of any top of bank or edge of water, N.J.A.C. 7:13-10.2(v) requires that all existing impervious surface within 25 feet of the top of bank or edge of water must be removed, and the riparian zone must be replanted with vegetation, with two exceptions discussed below. It is not uncommon in older developments for structures and other impervious surfaces to exist very close to the top of bank and, in some cases, pavement can extend up to the top of bank itself. Such development causes increased erosion within the channel, degrades water quality and poses a public safety risk since such structures can become undermined and sustain structural damaged and/or collapse as the size and shape of the channel changes over time.

In order to prevent such conditions from continuing, N.J.A.C. 7:13-10.2(v) requires that the area within 25 feet of the channel be adequately stabilized and restored with indigenous, non-invasive vegetation. This requirement applies only to those areas where redevelopment is proposed within 25 feet of the channel. If redevelopment occurs elsewhere on a site, and no work is proposed within 25 feet of the channel, N.J.A.C. 7:13-10.2(v) does not require that the existing impervious areas within 25 feet of the channel be removed. N.J.A.C. 7:13-10.2(v) also provides for two situations where an applicant is not required to restore and replant the riparian zone within 25 feet of the top of bank or edge of water:

- N.J.A.C. 7:13-10.2(v)1 provides for cases where an applicant demonstrates that removing the existing impervious surface, or preventing the replacement of the existing impervious surface, within 25 feet of the top of bank or edge of water would likely threaten public safety, exacerbate flooding or erosion or cause an undue economic hardship upon the applicant. In such a case, the riparian zone within 25 feet of the top of bank or edge of water must be restored, stabilized and replanted to the extent feasible.

- N.J.A.C. 7:13-10.2(v)2 also provides for cases where an applicant proposes to construct a public walkway within 25 feet of the top of bank or edge of water. A walkway in this area is permissible, provided it is constructed of permeable material where feasible in order to reduce potential impacts to water quality. Furthermore, the remainder of the area within 25 feet of the top of bank or edge of water must be restored, stabilized and replanted with indigenous, non-invasive vegetation.

Section 5

Aquatic Resources

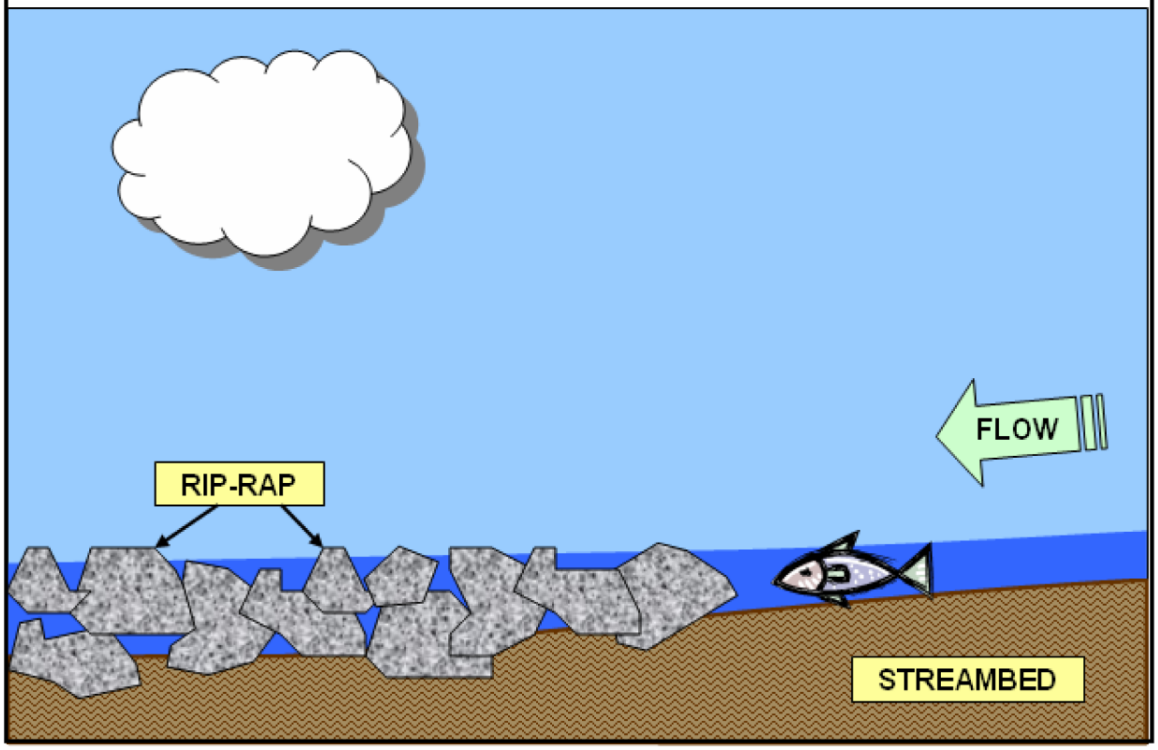
5.1 Introduction

The Flood Hazard Area Control Act rules set forth a number of requirements that must be met in order to protect aquatic species habitat. These requirements are primarily contained in the rules at N.J.A.C. 7:13-10.1 (Requirements for a regulated activity in a channel), N.J.A.C. 7:13-10.5 (Requirements for a regulated activity in or along a water with fishery resources) and N.J.A.C. 7:13-11.7 (Requirements for a bridge or culvert). These requirements are necessary since activities within and adjacent to surface waters, if improperly designed and constructed, can obstruct the passage of aquatic species, and can degrade aquatic habitat by introducing sediments and other pollutants into waters thereby impeding the species' ability to feed and procreate.

The Flood Hazard Area Control Act rules use the term "low-flow aquatic passage" to describe the ability of aquatic species to travel up and down a watercourse without impediment during low-flow conditions. The rules require that bridges, culverts and other manmade alterations to surface waters do not interfere with low-flow aquatic passage. During dry periods of the year, water typically collects in small rivulets in the stream bed, thereby permitting aquatic species to migrate upstream and downstream in search of food or for spawning. Structures with very flat bottoms eliminate this passage and form a barrier to aquatic species, thereby causing aquatic species to be trapped on one side of the structure until flow in the stream increases. This can also occur if non-native materials are placed in a channel or if the channel bed is graded in such a way that species are trapped in depressions (such as scour holes) or so that low-flow channels cannot form.

For example, rip-rap is sometimes placed in the stream bed to stabilize the channel after construction. Clean rip-rap contains many void areas between the stones which will fill with water until the voids are eventually filled with silt from the watercourse. Rip-rap can therefore become an impediment to low-flow aquatic passage, since water that normally flows on top of the stream bed will flow through the voids in the rip-rap. (See Figure 5.1 below.)

Figure 5.1



Construction activities must therefore be carefully designed in order to provide and maintain low-flow aquatic passage both during and after a construction project. As such, N.J.A.C. 7:13-10.1 and 11.7 set forth various standards designed to protect the integrity of the channel and to provide low-flow aquatic passage during and after construction, which is important for preserving aquatic habitat.

Construction activities within and adjacent to a surface water can also introduce sediment into the water which, as noted above, can adversely impact aquatic species as well. N.J.A.C. 7:13-10.5(d) therefore applies timing restrictions to construction, grading, excavation or filling within a channel or riparian zone, because those activities have a high likelihood of introducing sediment into surface waters.

Additionally, N.J.A.C. 7:13-11.7 sets forth requirements that must be met for the issuance of an individual permit for a bridge or culvert. In particular. N.J.A.C. 7:13-11.7(f) through (m) establish standards to protect aquatic habitat and maintain low-flow passage for aquatic biota, associated with the construction of a bridge or culvert. The Flood Hazard Area Control Act rules also divide all regulated waters into three categories that require different levels of protection, depending on the classification of the regulated water (Class A, B or C).

5.2 Class A, B and C Waters

Class A waters include the highest quality waters, such as Category One waters and waters containing certain fishery resources, within which aquatic biota require the highest level of protection. Class B waters include a set of waters that have less ecological value and, therefore, do not warrant the same level of protection as Class A waters. Lastly, Class C waters are those of low ecological value, such as those which contain no fishery resources or which are wholly manmade, and which, therefore, do not warrant as much protection as other regulated waters. N.J.A.C. 7:13-11.7(e) divides these three classes as follows:

Class A Waters

- Category One waters;
- Trout production waters;
- Trout maintenance waters;
- Trout stocked waters;
- Anadromous waters;
- Waters supporting cool and warmwater gamefish; and
- Waters supporting aquatic threatened and/or endangered species.

Class B Waters

- Waters supporting non-game cool and warmwater fish;
- Waters identified by the Department's Division of Fish and Wildlife as supporting aquatic biota, which are not otherwise listed as Class A above; and
- Waters that have been altered and/or degraded by lining, ditching, channel modification or other human activity, but which the Department determines can be restored and/or enhanced to support viable aquatic resources.

Class C Waters

- Waters that do not contain fishery resources;
- Waters that are wholly manmade (not naturally occurring waters that have been altered by human activity); and
- All other waters not otherwise included in Class A and Class B above.

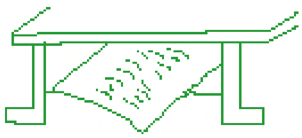
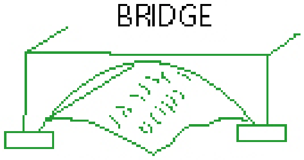
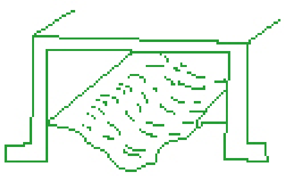
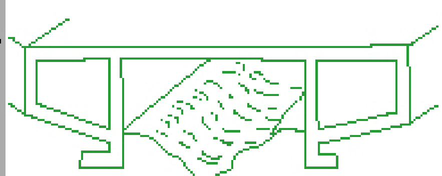
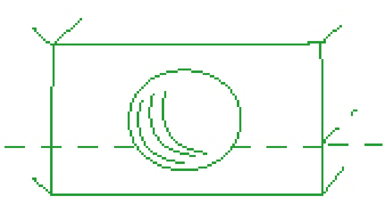
Various lists of waters that contain fishery resources are provided in Appendix 1 of this manual.

5.3 Aquatic Habitat Protection

N.J.A.C. 7:13-11.7(f), (g) and (h) require that a bridge or culvert be designed according to a hierarchy of preferred options, listed at N.J.A.C. 7:13-11.7(i), (j), (k) and (l), which are intended to maximize the preservation of low-flow aquatic passage and to limit disturbance to the channel. In other words, these sections establish a hierarchy for determining what type of bridge or culvert can be placed across Class A, B and C waters. In each case, the hierarchy is the same, but moving down the list of preferred structures (from 11.7(i) down to 11.7(l)) is hardest for Class A waters, less difficult for Class B waters, and easier still for Class C waters. Spanning the channel is always preferred, since spanning results in little or no permanent impact to aquatic biota. If spanning cannot be achieved, other means of crossing the channel are allowed provided the reasons for not spanning are acceptable. In certain cases, a waiver must be obtained pursuant to N.J.A.C. 7:13-11.7(m) in order to move down the list from 11.7(i) to 11.7(l). Depending on the class of the water, different tests are established whereby increasingly intrusive means of crossing the channel may be used.

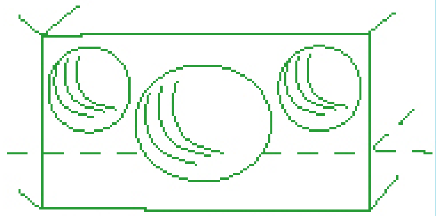
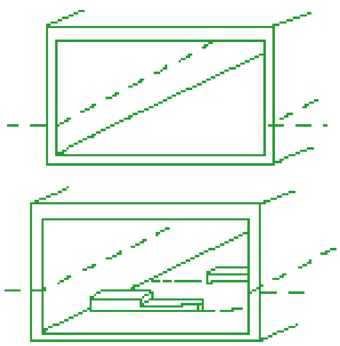
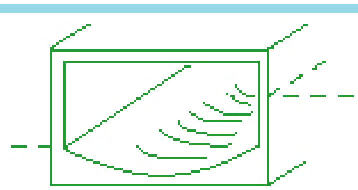
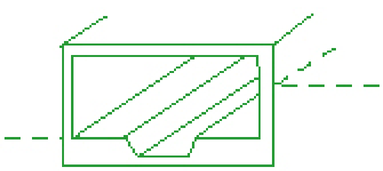
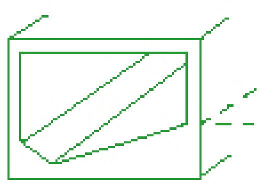
The following chart entitled "Low Flow Aquatic Passage for Bridges and Culverts" illustrates how the requirements of N.J.A.C. 7:13-11.7 are set forth. The dashed magenta line in the chart indicates that a waiver under N.J.A.C. 7:13-11.7(m) is required to construct any bridge or culvert depicted below the line. This only applies to the first two columns, since Class C waters do not require a waiver under N.J.A.C. 7:13-11.7(m). Nevertheless, moving down the chart in each column requires additional justification as described in the rules at N.J.A.C. 7:13-11.7(i), (j), (k) and (l). Note that this chart is intended only as a visual aide in order to assist understanding of the hierarchy presented at N.J.A.C. 7:13-11.7. Should this chart conflict with the requirements of the rules, the rules shall govern.

Low Flow Aquatic Passage for Bridges and Culverts

ORDER OF PREFERENCE		Class A> 5 ft NJAC 7:13-11:7(f)	Class A< 5 ft Class B NJAC 7:13-11.7(g)	Class C NJAC 7:13-11.7(h)
NJAC 7:13-11.7(i)	SPANNING  BRIDGE  ARCH CULVERT  3 - SIDED CULVERT	ACCEPTABLE Must utilize spanning of the stream. The stream bottom must remain intact. Span must be adequately sized such that there is no increase in velocity. There should be no need for hard armoring of the stream.	ACCEPTABLE Must utilize spanning of the stream. The stream bottom must remain intact. Span must be adequately sized such that there is no increase in velocity. There should be no need for hard armoring of the stream.	ACCEPTABLE Must utilize spanning of the stream. The stream bottom must remain intact. Span must be adequately sized such that there is no increase in velocity. There should be no need for hard armoring of the stream.
NJAC 7:13-11.7(j)	 SPANNING WITH SIDE-RELIEF CULVERTS	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	ACCEPTABLE Span a stream at bankfull flow (1.5 to 2-year storm); one or more side relief culverts are placed to carry additional storm/flood flows. Twin or multicell culverts should have the low flow treatment in only one of the culverts.	ACCEPTABLE Span a stream at bankfull flow (1.5 to 2-year storm); one or more side relief culverts are placed to carry additional storm/flood flows. Twin or multicell culverts should have the low flow treatment in only one of the culverts.
NJAC 7:13-11.7(k)	 OVERSIZED / BELOW GRADE	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	ACCEPTABLE Natural substrate must be placed in the culvert to form a low flow channel or a pool area. Minimum 2 feet deep. Must check for the stability of the backfill material.

PREFERRED

- - - Constructing a bridge or culvert (as depicted in this chart) below this line requires a waiver under NJAC 7:13-11.7(m)

ORDER OF PREFERENCE	Class A > 5 ft NJAC 7:13-11:7(f)	Class A < 5 ft Class B NJAC 7:13-11.7(g)	Class C NJAC 7:13-11.7(h)
NJAC 7:13-11.7(k)  BANKFULL CROSSING WITH RELIEF	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	ACCEPTABLE Span a stream at bankfull flow (1.5 to 2-year storm); one or more side relief culverts are placed to carry additional storm/flood flows. Below grade culvert may replace span in stable substrate. Twin or multicell culverts should have the low flow treatment in only one of the culverts.
NJAC 7:13-11.7(l)1  OVERSIZED / BELOW GRADE	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	ACCEPTABLE If the velocity of the stream is high, then the culvert may require baffles or weir plates to hold the substrate in place. In addition, native rock or cobble may be mixed with soil to form a more stable substrate inside the culvert.
NJAC 7:13-11.7(l)2  CONCAVE OR CENTER TILT  LOW FLOW "NOTCH"  TILTED	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	WAIVER Under N.J.A.C. 7:13-11.7(m) required to construct	ACCEPTABLE Degraded streams, poor ecological value, concrete bottoms, riprap/gabion bottoms, no aquatic and wildlife resources.

- - - Constructing a bridge or culvert (as depicted in this chart) below this line requires a waiver under NJAC 7:13-11.7(m)

Section 6

Threatened or Endangered Species

6.1 Threatened or Endangered Species Habitats

N.J.A.C. 7:13-10.6 sets forth requirements that must be met for the issuance of an individual permit for a regulated activity located in a regulated area with a threatened or endangered species of plant or animal or associated habitat. Specifically, N.J.A.C. 7:13-10.6(d) states that the Department shall issue an individual permit for a regulated activity only if the activity will not adversely affect either a threatened or endangered species or a documented habitat for a threatened or endangered species. This provision applies to all such species and their habitats, not only those that have been deemed to be critically dependant upon the regulated water for survival and therefore trigger a 150-ft riparian zone under N.J.A.C. 7:13-4.1(c)2iii. So while certain species will cause the riparian zone to be 150 feet wide, all threatened and endangered species within the jurisdiction of the Flood Hazard Area Control Act rules are protected. The critically dependent species are listed in Appendix 2 of this manual. The method for identifying threatened or endangered species habitats is discussed in section 6.2 and additional requirements for protection of the habitats of critically dependent species is discussed in section 6.3.

6.2 Identifying Threatened or Endangered Species Habitats

When determining whether or not any particular regulated water on a subject property features an area that contains documented habitat for threatened or endangered species, the Department will rely on information contained in the Natural Heritage Database and "New Jersey's Landscape Project" mapping. The Department will also utilize any additional information relating to the presence or absence of such species or their habitat, including, but not limited to, information submitted by the applicant.

Applicants can obtain information on the locations of threatened or endangered species and their habitats from the following sources:

- **Wildlife species:** Information on the occurrence of habitat for threatened or endangered wildlife (except for freshwater mussels, fish, marine mammals and marine turtles) can be found in the publication “New Jersey’s Landscape Project” and it’s accompanying maps (“Landscape Project maps”). The Department's Landscape Project maps, which list the endangered and threatened species documented to occur within specific mapped habitat areas, are available from the Department’s Division of Fish and Wildlife, Endangered and Nongame Species Program at the Division's web address, www.state.nj/us/dep/fgw/ensphome, or can be viewed through the Department’s interactive mapping tool at www.nj.gov/dep/gis/newmapping.

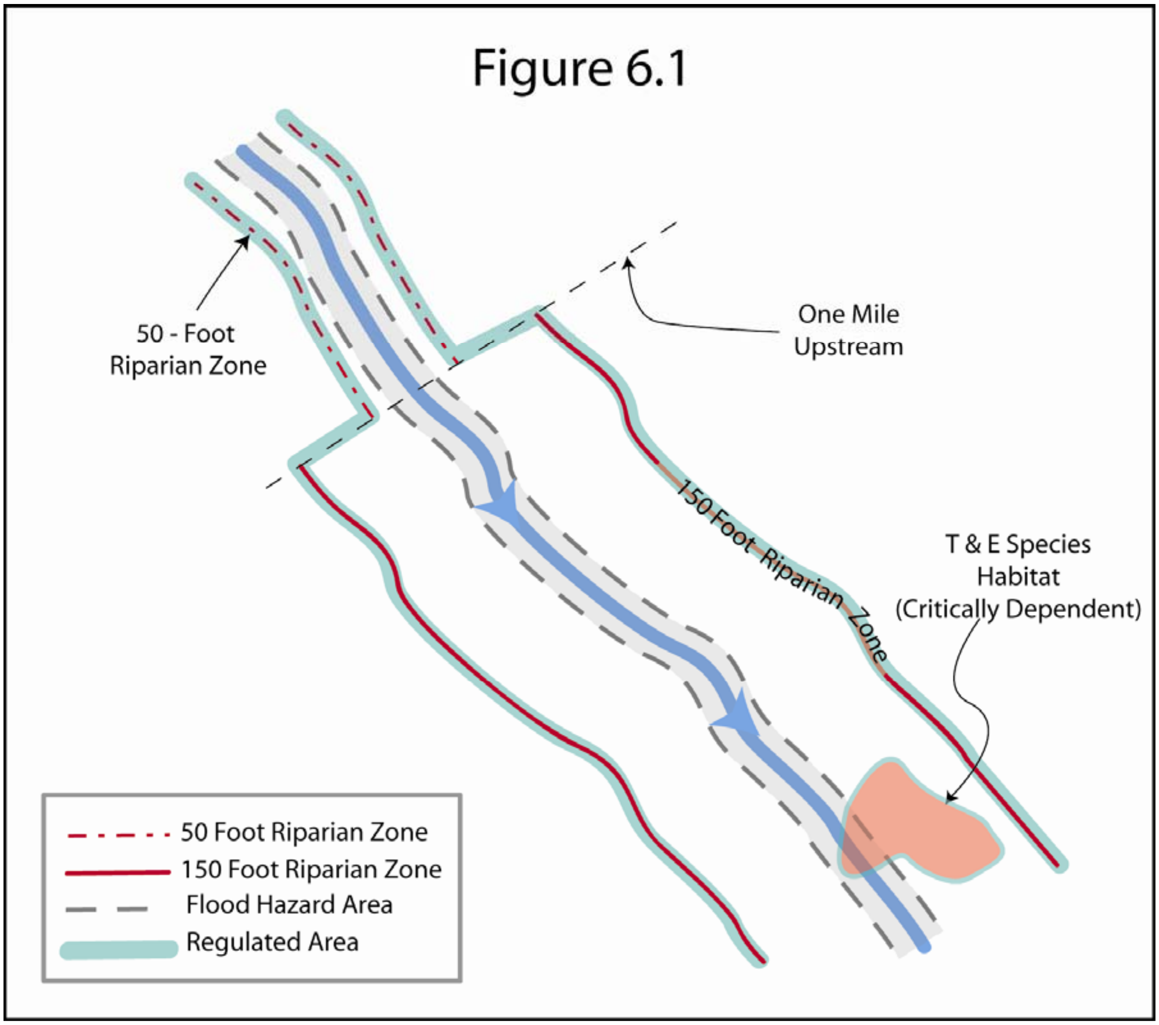
- **Plant species, freshwater mussels, fish, marine mammals and marine turtles:** Information on the occurrence of habitat for threatened or endangered plant species is available from the Department’s Office of Natural Lands Management, Natural Heritage Database at PO Box 404, Trenton, New Jersey 08625-0404. The Natural Heritage Database will also provide information on animal species, including freshwater mussels, fish, marine mammals and marine turtles, for which Landscape Project “models” do not exist or are incomplete statewide.

Proper identification of threatened or endangered species habitat on a project site is necessary in order to determine the need to comply with the requirements for the protection of threatened or endangered species habitat (discussed in section 6.4 of this manual). In addition, identification of threatened or endangered habitat for species which have been specifically identified as being “critically dependant upon the regulated water for survival,” occurring on site or up to one mile downstream, is one of several factors necessary to determine the width of the required riparian zone (as discussed in sections 4.4 and 6.3 of this manual).

When assessing the overall impacts that endangered or threatened species habitats have on a specific project site, applicants should first determine the degree to which species “critically dependant upon the regulated water for survival” affect the requirements of the riparian zone. Once the full extent of the riparian zone on the site has been determined, an assessment can be made regarding the possible occurrence of endangered or threatened species habitats within any of the regulated areas on site.

6.3 The 150-ft Riparian Zone

N.J.A.C. 7:13-4.1(c)2iii establishes a 150-ft wide riparian zone along both sides of all waters flowing through areas that support threatened or endangered species which are “critically dependant upon the regulated water for survival” and along all tributaries within one mile upstream. (See Figure 6.1.) A list of the threatened and endangered species considered to be “critically dependant upon the regulated watercourse for survival” is provided in Appendix 2.

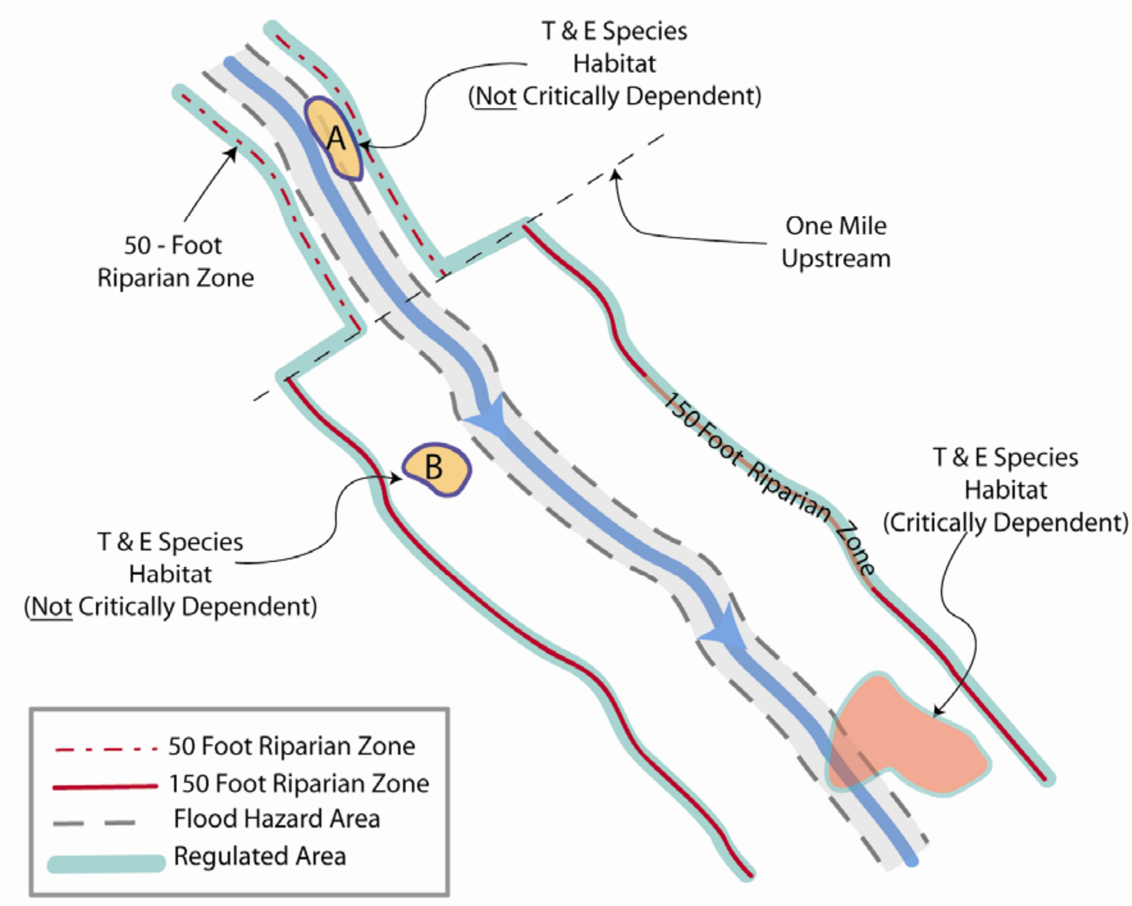


Given the sensitivity of threatened or endangered species to pollutants within stream corridors, an enhanced level of environmental protection has been determined to be appropriate for these waters and their tributaries. Since the 150-ft riparian zone is applicable to tributaries within one mile upstream of trout associated waters, the Department has determined that it is also appropriate to extend the same riparian zone along upstream tributaries within one mile of waters that support threatened or endangered species that are critically dependent on the regulated water to survive. The Department is limiting the waters that are provided this additional protection to those associated with threatened or endangered species that are critically dependent on the watercourse to survive because these are the species that will be impacted most by disturbances to the riparian zone.

6.4 Protection of Threatened or Endangered Species Habitats

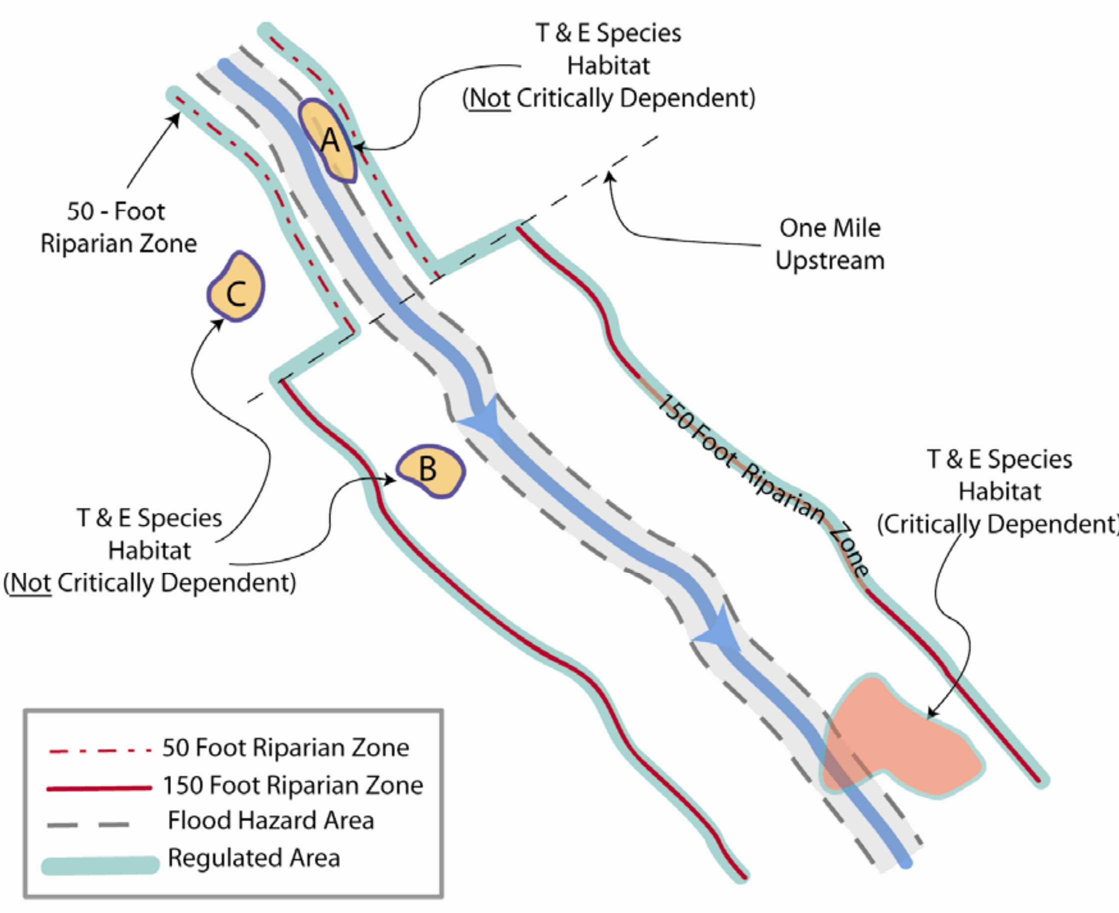
As noted above, the Flood Hazard Area Control Act rules protect all documented habitat for threatened or endangered species, which occur within the regulated area (flood hazard area and riparian zone) along a regulated water. Accordingly, all threatened or endangered species habitats occurring in the flood hazard area and minimum 50-ft riparian zone are protected. If a 150-ft riparian zone is required and extends into an area that itself contains threatened or endangered species habitat, even if not for a species critically dependent on the regulated water to survive, as shown in Figure 6.2 below, then that habitat falls within the regulated area and would receive protection under the Flood Hazard Area Control Act rules. The same would be true of any threatened or endangered species habitats occurring within a 300-ft riparian zone.

Figure 6.2



Conversely, if a regulated activity occurs on a project site, and that project site contains a threatened or endangered species habitat which occurs outside of a regulated area, that habitat does not benefit from protection under the Flood Hazard Area Control Act rules. The habitat must lie within a flood hazard area or riparian zone to receive any such protection. As shown in Figure 6.3 below, it would be possible for a threatened or endangered species habitat for a species that is not critically dependent on the regulated water to survive to fall outside of a 50-ft riparian zone (labeled below as Habitat C) and not receive protection under the Flood Hazard Area Control Act rules, whereas Habitats A and B in Figure 6.3 would receive protection under the rules.

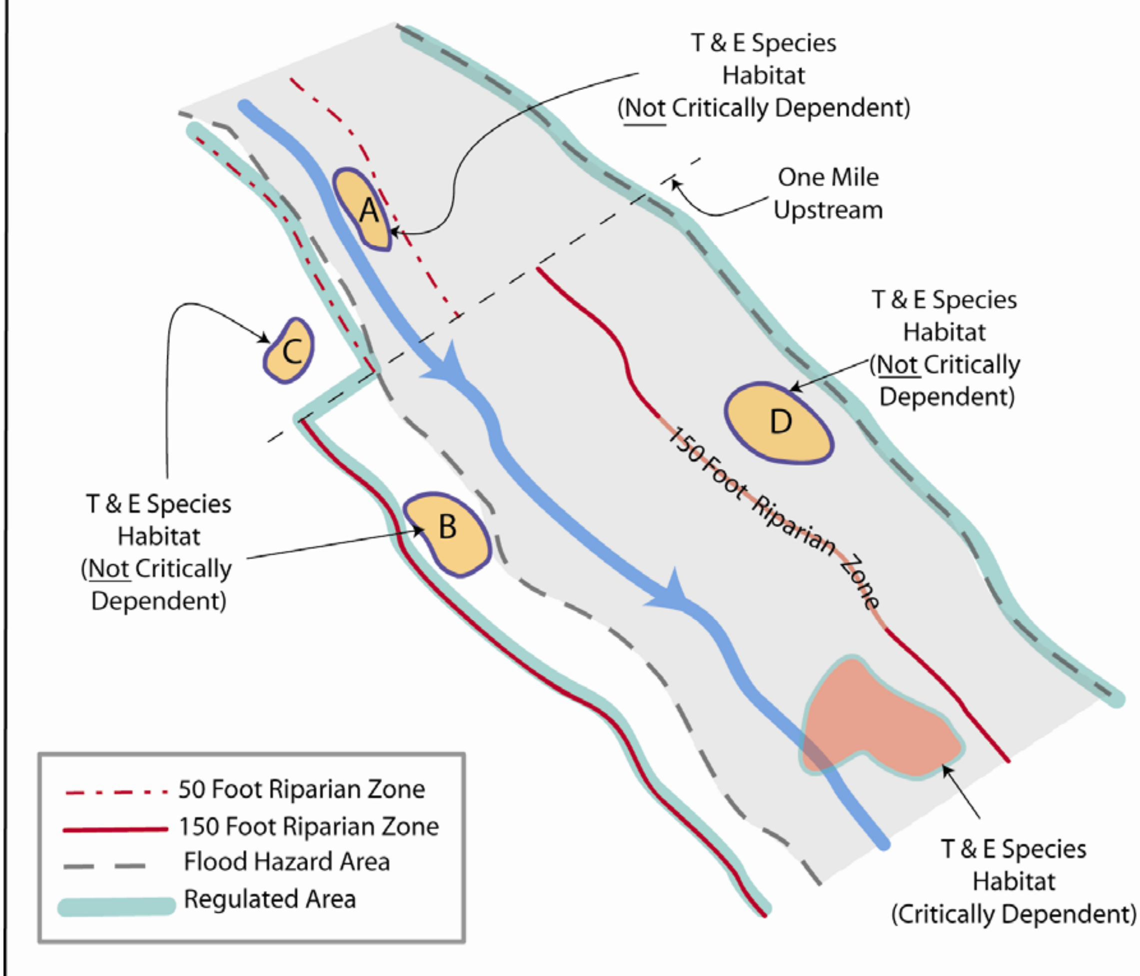
Figure 6.3



Similarly, threatened or endangered species habitat could occur just outside of either a 150-ft or 300-ft riparian zone. If this habitat was also outside of the flood hazard area, it would not be located in a "regulated area" and would therefore not be subject to the provisions of these rules. The proper identification of the "regulated area" is therefore very important as it relates to the protection of threatened or endangered species under these rules. The regulated area can vary from site to site or even one side of a regulated water to the other. As an example shown below in Figure 6.4, the extent of the “regulated area” extends from the edge of the riparian zone on the left side of the regulated water, across the regulated water and the extent of the riparian zone on the right side of the regulated water, and ends at the edge of the flood hazard area on the right side of the regulated water. Under this scenario:

- Habitat A falls within both the flood hazard area and the 50-ft riparian zone, and is therefore protected.
- Habitat B falls outside the flood hazard area, but is within the 150-ft riparian zone, and is therefore protected.
- Habitat C falls outside both the riparian zone and the flood hazard area, and is therefore not protected.
- Habitat D falls outside the 150-ft riparian zone, but is within the flood hazard area, and is therefore protected.

Figure 6.4



6.5 Threatened or Endangered Species Habitat in the Coastal Zone

The standards of the Flood Hazard Area Control Act rules apply to all flood hazard areas and riparian zones throughout the State. However, pursuant to N.J.A.C. 7:13-2.1(b)5, obtaining a CAFRA or waterfront development permit, pursuant to N.J.A.C. 7:7 and N.J.A.C. 7:7E, will satisfy the requirements of the Flood Hazard Area Control Act rules. In other words, if you obtain a CAFRA or waterfront development permit for a regulated activity, you will not need a separate flood hazard area approval. This is appropriate since the Department will review the regulated activity for compliance with the Flood Hazard Area Control Act rules during the review of the CAFRA or waterfront development permit.

N.J.A.C. 7:13-2.3(a)2 explains that a riparian zone exists along every regulated water, except there is no riparian zone along the Atlantic Ocean nor along any manmade lagoon, stormwater management basin, or oceanfront barrier island, spit or peninsula. The vegetation, topography, landscape and development typical along these tidal features are significantly different from other riparian areas in the State. Existing coastal policies that protect these unique tidal landforms, as well as other policies specific to the beach areas, recognize the types of impacts that are specific to these areas and therefore provide adequate protection to vegetation along these tidal waters. However, all other tidal waters will possess a riparian zone if the requirements of N.J.A.C. 7:13-2.3 are met. Furthermore, all tidal waters possess a flood hazard area. The standards of the Flood Hazard Area Control Act rules therefore apply to regulated activities in these areas.

The Special Area Rule (N.J.A.C. 7:7E-3.26, Riparian Zones) incorporates and/or reflects elements of the Flood Hazard Area Control Act rules and the Flood Hazard Special Area Rule at N.J.A.C. 7:7E-3.25. N.J.A.C. 7:7E-3.26 establishes a riparian zone adjacent to waters that are regulated waters under the Flood Hazard Area Control Act and rules. Of note, N.J.A.C. 7:7E-3.26(f) provides that if endangered and/or threatened wildlife or plant species habitat is present in the riparian zone such that the area is also a threatened or endangered wildlife or plant species habitat special area in accordance with N.J.A.C. 7:7E-3.38, Endangered or threatened wildlife or vegetation species habitats, then the requirements of N.J.A.C. 7:7E-3.38 regarding the protection of the habitat shall apply.

6.6 Requirements for Activities in Threatened or Endangered Species Habitat

The Flood Hazard Area Control Act rules in Subchapter 7, Permits-By-Rule, and Subchapter 8, General Permits, establish processes whereby a regulated activity can be permitted for activities in the flood hazard area and riparian zone. Subchapter 9, Individual Permits, sets forth the process for projects that do not meet the requirements for a permit-by-rule or general permit and would require the issuance of an individual permit to be legally accomplished. The design and construction standards for a project under an individual permit are contained in Subchapter 10, Individual Permit Requirements within Various Regulated Areas, and Subchapter 11, Individual Permit Requirements for Various Regulated Activities.

Permits-By-Rule

The Department has determined that if regulated activities are undertaken as prescribed within the limits of one of the 46 permits-by-rule set forth at N.J.A.C. 7:13-7.2(a) through (f), the impact on flooding and the environment will be *de minimis*. Therefore, no review or consideration of threatened or endangered species are required under a permit-by-rule. For more information on permits-by-rule, please refer to section 10 of this manual.

General Permits

General permits are set forth under N.J.A.C. 7:13-8. No public notice is required for an application for a general permit authorization. The Flood Hazard Area Control Act rules establishes general permits for 16 activities that have been identified as having minimal impacts on flooding and the environment if they are performed in an appropriate manner. N.J.A.C. 7:13-8.1(b) sets forth the conditions that apply to all general permits, and includes a requirement that the activity must not adversely affect threatened or endangered species. Therefore, if a proposed activity under one of the 16 general permits will adversely impact a threatened or endangered species habitat within the regulated area, then that project cannot obtain a general permit and must obtain an individual permit to be legally accomplished. More information on general permits can be found in section 11 of this manual.

Individual Permits

N.J.A.C. 7:13-10.6 sets forth requirements that must be met for the issuance of an individual permit for a regulated activity located in a regulated area with a threatened or endangered species of plant or animal or associated habitat. While the Department maintains that the critical dependency of a particular plant or wildlife species on the watercourse is an appropriate factor in determining the width of the riparian zone (see section 4 of this manual), it is also necessary to protect a threatened or endangered species that may not be critically dependent on the actual watercourse itself, but is dependent upon habitat or related resources in the flood hazard area or riparian zone. Therefore all threatened or endangered species habitats occurring in the regulated area, whether or not the species is critically dependant upon the watercourse itself, will be protected.

N.J.A.C. 7:13-10.6(e) provides that the Department will require a survey for threatened and endangered species if a project is likely to disturb an area known to contain a threatened or endangered species, or an area containing habitat that could support a threatened or endangered species. The specific requirements for the survey are located at N.J.A.C. 7:13-15.5, Environmental Reports, specifically N.J.A.C. 7:13-15.5(c). More information on individual permits can be found in section 12 of this manual.

All individual permit applications shall include an assessment of the project site's status with regard to the Department's Landscape Project mapping and a review letter from the Department's Natural Heritage Program specific to the project site. The Landscape Project mapping assessment and Natural Heritage Program review letter shall, at a minimum, confirm the status for all species onsite and up to one mile away from the site.

The Natural Heritage Program review letter is necessary to determine the impact of the regulated activity on all plant species, as well as on populations of freshwater mussels (which have been determined to be critically dependent on the regulated water for survival), fish, marine turtles and marine mammals, as these species are not currently mapped by the Landscape Project mapping.

Section 7

Acid Producing Soil Deposits

This section addresses the identification and treatment of acid producing soil deposits. For information regarding the width of the riparian zone as it relates to acid producing soil, see section 4 of this manual.

7.1 Introduction

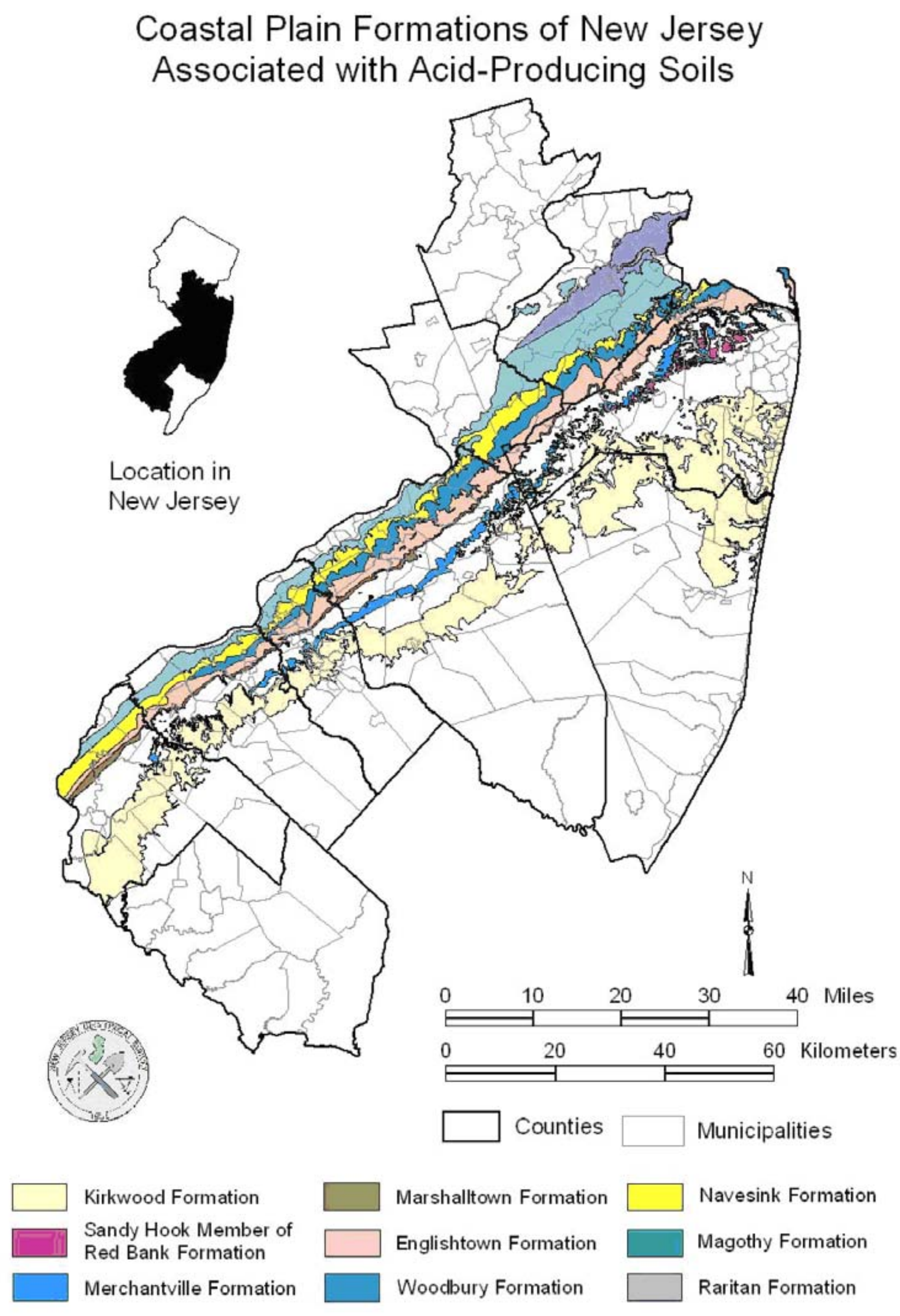
Upon exposure to oxygen from the air or from surface waters, iron sulfide minerals (pyrite or marcasite) oxidize and produce sulfuric acid. For this reason, geologic deposits which contain such minerals are called "acid producing soil deposits". The sulfuric acid increases the solubility of metals to the extent that the metals can become toxic to aquatic life or land vegetation, or can reach concentrations undesirable in sources of potable water supply. This section describes how acid producing soil deposits can be identified and provides guidelines to prevent or minimize the problem of water pollution and soil contamination that may otherwise be caused by exposure of these acid producing soil deposits.

7.2 Location of Acid Producing Soil Deposits

The following geologic formations in the coastal plain physiographic province in New Jersey sometimes contain substantial acid producing soil deposits:

- Englishtown Formation
- Kirkwood Formation
- Magothy Formation
- Marshalltown Formation
- Merchantville Formation
- Navesink Formation
- Raritan Formation
- Sandy Hook Member of Red Bank Formation
- Woodbury Formation

Figure 7.1



This map shows the location of geologic formations in the Coastal Plain that are the source of acid-producing soils. These formations are organic-rich silts and clays containing the iron sulfide mineral pyrite (FeS_2). When exposed to the atmosphere the sulfides often become oxidized to produce sulfuric acid in the soil.

Note: Depth from surface to formations varies throughout the region

Figure 7.1 provides the general location of these formations. Not all deposits within these formations are acid producing soil deposits, and only selected members of the Englishtown, Red Bank Sand and Kirkwood Formation contain acid producing soil deposits. The locations of these formations can also be viewed and verified using I-Map NJ Geology, a web-based, interactive GIS mapping tool provided by the Department. In order to use this tool:

1. Log on to www.state.nj.us/dep
2. On the left hand side of the page, select I-Map NJ
3. Scroll down and click on I-Map NJ Geology
4. Select Launch I-Map NJ Geology
5. On the left hand side of the page, select Bedrock Geology to be Visible and Active
6. Click on Refresh Map at the top of the legend
7. Zoom in to the area of interest
8. Once you find the area in question, click on Identify, located at the top of the page, and click the site to get the geologic formation name
9. If the site is located in an area that contains the following formations, a 150-ft riparian zone is imposed on that site:
    - Englishtown Formation
    - Kirkwood Formation
    - Magothy Formation
    - Marshalltown Formation
    - Merchantville Formation
    - Navesink Formation
    - Raritan Formation
    - Sandy Hook Member of Red Bank Formation
    - Woodbury Formation

The Department will rely on I-Map NJ Geology to verify the presence or absence of acid producing soil deposits on each site during its application review. If I-Map NJ Geology indicates that acid producing soil deposits are present on a site, and an applicant wishes to refute the mapping and demonstrate that acid producing soil deposits are, in fact, not present, the following procedure is to be followed:

1. At least three soil borings are to be taken within 150 feet of each regulated water onsite, spaced regularly throughout the area being tested, and at intervals of no more than 200 feet.
    a. Where possible, boring locations should be staggered so that half are within 75 feet of the regulated water and half are more than 75 feet away (see the diagram below for an example).
    b. One of the soil borings along each regulated water should be located at the point with the lowest topographic elevation in the area.
    c. If an applicant desires a riparian zone verification for the entire site, soil borings must be taken within 150 feet of each regulated water throughout the entire site. If the site spans a regulated water, borings are to be taken on both sides of the water.

d. If an applicant submits a flood hazard area permit application with a verification application, and the applicant is interested only in verifying the riparian zone limits adjacent to the proposed construction onsite, borings need only be taken within the areas proposed to be disturbed that lie within 150 feet of each regulated water.

e. Should the above guidelines result in a boring being situated within an area currently occupied by structures or pavement, a boring may instead be taken at the nearest location onsite that is absent of such features.

f. Should the above guidelines result in a boring being taken in an area that is subject to active and current use, such as an athletic field or utility line right-of-way, and the applicant demonstrates that taking the boring would cause a hardship and/or create an unsafe condition onsite, applicants should contact the Department to determine whether alternative boring locations may be acceptable.

g. Borings are not to be taken within stream channels or other open waters, nor along slopes greater than 15% along tidal waters.

h. No trees within a riparian zone should be cleared, cut or removed to accommodate the boring locations. A flood hazard area permit is not required prior to taking soil borings, provided all disturbed areas within any riparian zone are restored to their original vegetated coverage and no trees are disturbed.

i. Applicants should also avoid situating borings within freshwater wetlands and transition areas. Where it is not feasible to avoid these areas, prior freshwater wetlands approval from the Department under N.J.A.C. 7:7A is required.

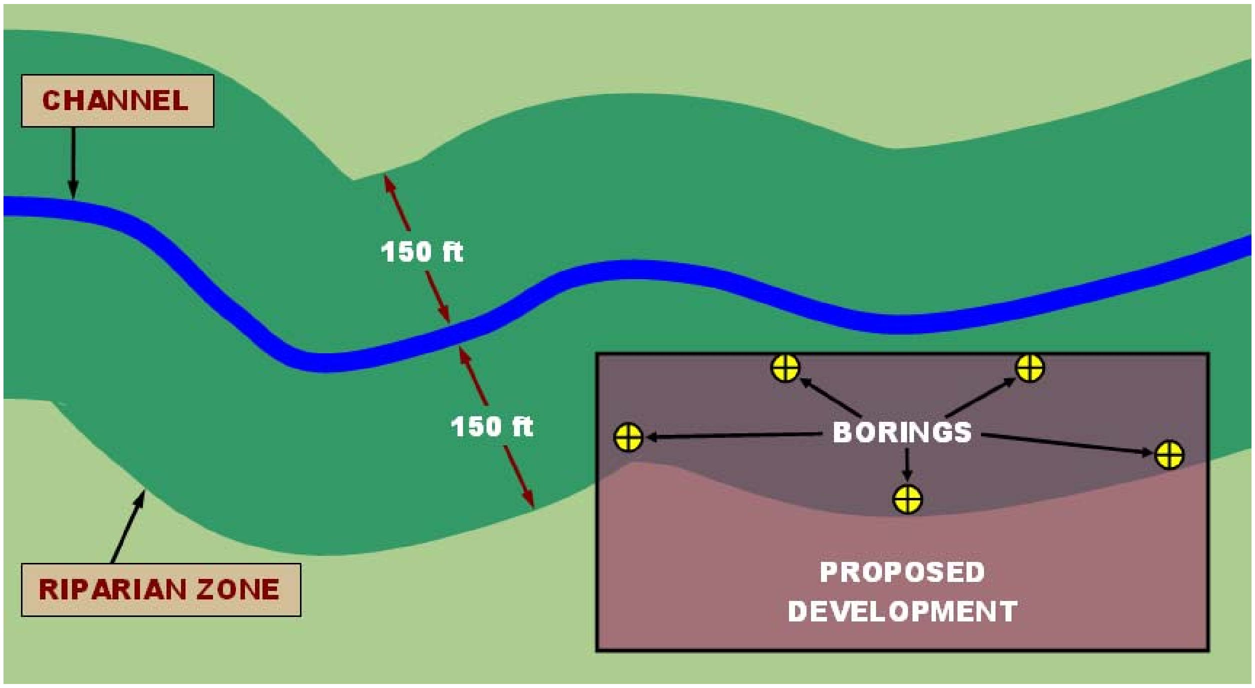
2. Each boring is to be taken to a depth of 10 feet, or 1 foot greater than the depth of any proposed excavation onsite, whichever is greater.

3. Within each soil column, grab samples are to be taken within each discrete soil stratum, or every 3 feet, whichever is less. Samples must also be taken at the bottom of the soil column. Each sample should be examined separately, by an independent soil lab, for the possible presence of acid producing soil deposits in accordance with the visual and chemical testing procedure outlined in sections 7.3 and 7.4 of this manual.

4. A site plan is to be submitted to indicate the location of each soil boring. A soil log must accompany the site plan which, at a minimum, identifies the location, depth, munsel color and texture of each sample. Furthermore, the results of any soil sampling shall be prepared in accordance with the procedures set forth in the USDA National Survey Field Manual.

5. If the soil lab concludes that none of the samples shows evidence of acid producing soil deposits, the Department will accept the testing data from the applicant and confirm during its application review that the 150-ft riparian zone associated with acid producing soil deposits will apply to the site or project.

Figure 7.1



7.3 Site Evaluation

As discussed in the following sections, one principal method of preventing or minimizing problems caused by exposure of acid producing soil deposits is to minimize the rate at which acid is produced by minimizing the time during which these deposits are exposed. The prompt burial of acid producing soil deposits under one foot of soil reduces the availability of oxygen and therefore the rate at which acid is produced. The current *Standards for Soil Erosion and Sediment Control in New Jersey* require that "soils having a pH of four (4) or less or containing iron sulfide shall be covered with a minimum of twelve (12) inches of soil having a pH of five (5) or more before seedbed preparation."

When excavation in any of these nine geologic formations is being considered, preconstruction borings should be taken to a depth one foot greater than the proposed depth of excavation. The entire length of such borings should be examined for the possible presence of acid producing soil deposits. Acid producing soil deposits are typically found in gray, dark brown, or black materials (sometimes with a greenish tinge) which have a clay-plus-silt content exceeding thirty (30) percent on a dry weight basis. In the American Society for Testing and Materials (ASTM), soil classification System (Unified), a clay-plus-silt content exceeding thirty (30) percent on a dry weight basis corresponds to the SC, CH, CL, ML classifications. In the

USDA system, the approximately equivalent textural classes are: clay, silty clay, sandy clay, clay loam, silty clay loam, sandy clay loam, loam, silt loam, and silt.

(Not all such materials, however, are acid producing soil deposits.) Sandier materials, or reddish, yellowish, or light to medium brown materials, are generally free of acid producing soil deposits. Acid producing soil deposits may be dominant in a particular profile, or may be confined to specific layers or lenses in the profile. Crystals of pyrite or marcasite are positive evidence of acid producing soil deposits, but sometimes the crystals are too small for recognition by ordinary means in the field. Simple chemical tests, described in the following section, are useful for identifying acid producing soil deposits that contain these very small crystals. Detailed logs of pre-construction borings and the location and results of chemical tests should be submitted for review. The simple chemical tests should be performed on gray, dark brown, or black (sometimes greenish) materials which have a clay-plus-silt content exceeding thirty (30) percent on a dry weight basis*, or which are suspected of being acid producing .

The nine geologic formations listed above can be divided into two classes, as follows:

Class I	Class II
• Englishtown Formation • Magothy Formation • Raritan Formation	• Kirkwood Formation • Marshalltown Formation • Merchantville Formation • Navesink Formation • Sandy Hook Member of Red Bank Formation • Woodbury Formation

In Class I formations, clayey deposits (some of which contain acid producing soil deposits) are (in general) distributed irregularly throughout the formation in beds, lenses, and pods of highly variable thickness. In Class II formations, the entire formation consists of clayey deposits (Merchantville, Woodbury, Marshalltown, Navesink) or the clayey deposits are restricted to a thick bed in one part of the formation (Red Bank Sand, Kirkwood). As a general guideline, pre-construction borings should be spaced 200 feet apart in Class I formations and 500 feet apart in Class II formations. These spacings may be modified as local geological conditions warrant. Applicants are encouraged to discuss their intended methodologies with the Department and the local Soil Conservation District to ensure that the selected testing protocols are appropriate for the site and potential soil formations.

7.4 Chemical Tests for Acid Producing soil deposits

Two simple tests for pH and sulfate should be performed in the field or laboratory during preconstruction investigations and during construction to identify the presence of acid producing soil deposits. These tests are particularly useful for identifying deposits containing very small crystals of pyrite or marcasiste that cannot be recognized by ordinary means in the field. These tests give positive results only when the samples from an acid producing deposit have oxidized or have begun to oxidize. When the results of both tests are positive, the presence of acid producing soil deposits is confirmed.

However, negative results in field tests do not prove the absence of acid producing soil deposits since the samples may not have undergone appreciable oxidation before the field tests were performed. When results are positive in one of the two field tests, or when for other reasons deposits are suspected to be acid producing, additional samples should be brought to the laboratory so that the tests may be repeated on laboratory-oxidized samples (see section 7.4.3). This applies, in particular when in a field test the pH value in calcium chloride solution is between 3.0 and 4.0

The exact same soil samples should not be used for both tests. Instead, soil samples should be mixed and divided into two parts, one part to be tested for pH and the other to be tested for sulfate.

7.4.1 pH Value in Calcium Chloride Solution

1. *General Discussion*

The pH value of a suspension of soil material in distilled water measures only the activity of the dissociated hydrogen ions. Many more hydrogen ions remain adsorbed on the cation exchange surfaces of the soil material particles. When soil material is instead suspended in a moderately strong solution of calcium chloride, calcium ions displace hydrogen ions from the cation exchange surfaces. The displaced hydrogen ions go into solution, whose pH is then measured. So long as calcium ions are present in excess, the exact concentration of calcium ions in the suspension is not critical (this concentration will vary somewhat with the moisture content, bulk density, cation exchange capacity and base saturation of the soil material sample).

Solutions of calcium chloride in distilled water are generally alkaline or acidic because of impurities in the dry calcium chloride reagent. The calcium chloride solution is made neutral by the addition of hydrochloric acid or sodium hydroxide before the solution is mixed with the soil material sample.

2. *Apparatus*

i. pH meter - Consisting of potentiometer, glass electrode, reference electrode, and a temperature compensating device. Standardize according to manufacturer's instructions. When only occasional pH measurements are made, standardize the pH meter before each measurement. When frequent measurements are made and meter readings are stable, standardize less frequently but at least daily.

ii. Beakers - Preferably use polyethylene or TFE (Teflon or equivalent) beakers. The beaker which will hold the sample of soil material should have a capacity equal to or exceeding 250 mL.

iii. Buret - Borosilicate glass.

iv. Titration vessel - Borosilicate glass.

v. Stirrer - For neutralization of calcium chloride reagent, use either a magnetic, TFE-coated stirring bar or a mechanical stirrer with inert, plastic-coated impeller.

vi. Stirring rod - For mixing soil material with neutralized calcium chloride reagent, preferably use an inert plastic stirring rod.

3. *Reagents*

The following reagents are to be prepared in the laboratory:

i. Hydrochloric acid, 1.0N (approximate) - Add 83 mL of ACS-grade (36-37%) hydrochloric acid to 500 mL of distilled water. Dilute to 1,000 mL with distilled water and mix thoroughly.

ii. Hydrochloric acid 0.1N (approximate) - Dilute 100 mL of 1.0N (approximate) hydrochloric acid to 1,000 mL with distilled water and mix thoroughly.

iii. Sodium hydroxide solution, 1.0N (approximate) - Add 40 g ACS grade solid NaOH to 500 mL distilled water.

iv. Sodium hydroxide solution, 0.1N (approximate) - Dilute 100 mL of 1.0N (approximate) sodium hydroxide solution to 1,000 mL with distilled water and mix thoroughly.

Store 1.0N and 0.1N sodium hydroxide solutions in polyethylene (rigid, heavy type) bottles with polyethylene screw caps, paraffin-coated bottles with rubber or neoprene stoppers, or borosilicate glass bottles with rubber or neoprene stoppers.

v. Neutralized calcium chloride reagent, 0.5M (approximate) - Add 73.5 g ACS-grade $CaC_{122}H_{20}$ to 500 mL distilled water. Dissolve and mix thoroughly. Adjust pH to 7.0 using a buret, titration vessel, stirrer, pH meter, and 1.0N and 0.1N solutions of hydrochloric acid or sodium hydroxide. (if the initial pH exceeds 7.0, use 1.0N and 0.1N solutions of hydrochloric acid. If the initial pH is less than 7.0, use 1.0N and 0.1N solutions of sodium hydroxide. Add 1.0N hydrochloric acid or sodium hydroxide solution dropwise; mix thoroughly and measure pH after the addition of each drop. When pH approaches 7.0, complete the neutralization by dropwise addition of 0.1N solutions of hydrochloric acid or sodium hydroxide.) Dilute to 1,000 mL with distilled water and mix thoroughly.

4. Procedure

i. Rinse a clean polyethylene or TFE beaker (250 mL or larger capacity) and a plastic stirring rod thoroughly with tap water and then distilled water. Fill the beaker to a depth of approximately one (1) inch with the sample of soil material (at field moisture content if the test is performed in the field).

ii. Add neutralized calcium chloride reagent to the beaker until the total depth of soil material plus reagent is approximately two (2) inches.

iii. Stir the contents of the beaker thoroughly with a plastic stirring rod. Allow the contents to stand at least fifteen (15) minutes. Stir the contents thoroughly again, allow the contents to stand at least five (5) minutes, and measure the pH of the supernatant liquid.

5. Interpretation of results

pH values below 3.0 indicate the presence of ferrous sulfate, and the presence of acid producing soil deposits should be strongly suspected (Reference No. 23). pH values between 3.0 and 4.0 are also of concern if they occur in field tests; in such cases the test should be repeated in the laboratory on a replicate soil material sample that has been oxidized in the laboratory (see section 7.4.3).

6. Alternate methods of pH measurement

pH paper or indicator solutions may be used in the field instead of pH meters if these alternative methods are accurate to 0.2 pH units in the pH range of 2.5 to 4.5 and if color or turbidity in the calcium chloride extract of the soil material sample does not interfere with the test. (In some cases interfering color or turbidity can be removed by filtering the extract.) Use only pH meters in the laboratory.

7.4.2 Qualitative Test for Sulfate Ion

1. General discussion

Sulfate is precipitated as barium sulfate by the addition of barium chloride. The formation of obvious turbidity when barium chloride is added to a distilled water extract of the soil material sample confirms the presence of appreciable quantities of sulfate ions. Barium carbonate or barium phosphate should not precipitate so long as the pH of the distilled water extract is 5.0 or less (see American Public Health Association et al., 1981, pp. 437-438).

2. Apparatus

Beakers and flasks - Preferably use borosilicate glassware. The beaker which will hold the sample of soil material shall have a capacity between 250 mL and 500 mL, inclusive.

Stirring rod - For mixing soil material with distilled water, preferably use an inert plastic stirring rod.

3. Reagents

Barium chloride solution, 10% (approximate) - Add 66.6 g ACS-grade $BaC_{12}H_{20}$ to 500 mL distilled water; dissolve and mix thoroughly. Solution should be free from obvious turbidity; if there is no alternative, obvious turbidity should be removed by filtration through a membrane filter or hard-finish filter paper.

4. Procedure

i. Rinse a clean glass beaker (250-500 mL capacity) and a plastic stirring rod thoroughly with tap water and then distilled water. Fill the beaker to a depth of approximately one (1) inch with the sample of soil material (at field moisture content if the test is performed in the field).

ii. Add sulphate-free distilled water to the beaker until the total depth of soil material plus water is approximately two (2) inches.

iii. Stir the contents of the beaker thoroughly with a plastic stirring rod. Allow the contents to stand at least fifteen (15) minutes. Stir the contents thoroughly again, and allow the contents to stand at least five (5) minutes.

iv. Add one (1) drop of barium chloride solution. Voluminous flocs of barium sulfate will form immediately if appreciable quantities of sulfate ions are present.

7.4.3 Laboratory Oxidation of Soil Material

1. ***General discussion***

   As noted in the beginning of section 7.4, field tests on samples of acid producing soil deposits may be negative if the samples have not sufficiently oxidized, and it may be necessary to repeat either or both tests on laboratory-oxidized samples. The simplest way of oxidizing the samples is to dry them for several hours at an elevated temperature.

2. ***Apparatus***

   Evaporating dish, porcelain.
   Drying oven, for operation at 110°C.

3. ***Procedure***

   Fill a 250 mL capacity beaker that will be used for the pH test (section 7.4.1) or the qualitative test for sulfate ion (section 7.4.2) to a depth of approximately one (1) inch with the sample of soil material to be oxidized. Transfer the soil material from the beaker to the evaporating dish.

   Place the evaporating dish in the drying oven and dry the sample for at least 8 h at 110°C. Cool to room temperature.

   Transfer the soil material sample back to the beaker and, as appropriate, test for pH value or sulfate in accordance with section 7.4.1 or section 7.4.2 above.

7.5 General Mitigation Standards

1. The area of acid producing soil deposits exposed should be no larger than that which is absolutely necessary for the conduct of the project.

2. Construction schedules should be formulated to provide minimum practicable exposure of acid producing soil deposits.

3. Where the top layer of soil (remaining after clearance of vegetation) is free from acid producing soil deposits, such soil should be stripped and stockpiled separately from the deeper, acid producing soil deposits to be exposed. No acid producing soil deposits shall be included in this stockpile.

4. Acid producing soil deposits (including soil contaminated with such deposits and contaminated soil washed from construction equipment) should not be exposed for more than eight hours except where absolutely necessary for the conduct of the project. If such deposits must be exposed for more than eight hours, such deposits should be covered with pulverized limestone at the rate of 30 tons per

acre (1375 pounds per 1,000 square feet) and then covered with a minimum of one foot of compacted topsoil (free of acid producing soil deposits) within one week after exposure, or before the pH of a well-mixed sample from the uppermost two inches of the exposed deposit drops to 3.0, whichever occurs first.

5. Equipment used for excavating or backfilling acid producing soil deposits should be cleaned at the end of each day's operation in such a way that will not cause the spreading of acid producing soil deposits onto uncontaminated soil or into the watercourse.

6. Every effort should be made to minimize the spreading or mixing of acid producing soil deposits (including soil contaminated with such deposits) onto or into soil free of such deposits (on or off the construction site). No construction should take place during rainstorms or while the ground is saturated, if such construction is likely to smear or spread acid producing soil deposits over uncontaminated soil or into waterways. If acid producing soil deposits must be stock-piled on top of soil heretofore free of such deposits, the area used for stockpiling should be minimized. Erosion and sediment control measures should be applied where acid producing soil deposits are exposed or stockpiled, to prevent or reduce the movement of acid producing material into watercourses or onto contaminated soil.

7. Excavated material should be returned to trenches or pits in the order of its removal, i.e., lower material first, followed by upper material. (However, if acid producing soil deposits are found only in the upper material, then the upper material should be returned first. This exception also applies to the following sentences). Where acid producing soil deposits are stockpiled on soil heretofore uncontaminated with such deposits, the top two inches of such soil should be scraped off and buried along with the "lower material." The surplus material resulting due to permanent grade reduction, placement of pipes or other structures, and soil scraped from areas under temporary stockpiles of acid producing soil deposits, should be substituted for an equal quantity of deeper material which in turn should be removed to a suitable disposal site. After backfilling the deeper material, pulverized limestone should be spread over the top of the material, at the rate of ten (10) tons per acre (460 pounds per 1000 square feet), before the application of the surface layer of soil. This liming procedure is applicable only in well-drained areas. The top layer of soil, free of acid producing soil deposits, stripped and stockpiled in item 3 above, should then be replaced. If necessary, additional quantities of topsoil should be imported so as to ensure at least one (1) foot deep cover of soil, free of acid producing soil deposits. Restrictions established in the rules concerning the amount of net fill that may be placed in flood hazard areas must also be complied with.

8. Temporary vegetative cover should not be used for stabilization of acid producing soil deposits unless the liming and topsoil application requirements of item 7, and the surface soil pH requirements of item 9 are first met. Otherwise, temporary stabilization of acid producing soil deposits should be accomplished with "mulch only", in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey." No more than eight hours should elapse before

the application of mulch. (Mulching for temporary stabilization is not a substitute for the limestone and topsoil application requirements of items 4 and 7. Mulch should not be directly applied to the exposed surface of acid producing soil deposits, but rather to the topsoil applied to cover such deposits.)

9. Permanent vegetation should be established as soon as possible taking into account the six weeks that may be needed for the "incubation test" discussed below. Revegetation must be performed under the direction of a soils specialist or agronomist, who by training or experience is familiar with the problems of revegetating acid producing soil deposits. The soils specialist or agronomist should perform pH tests on the surface layer of soil where the vegetation will root (allowing for root expansion due to plant growth). If the pH is below 4.0, the soils specialist or agronomist should also perform incubation lime requirement tests (soil sample allowed to oxidize for six (6) weeks) to determine lime application rates. The pH of the surface layer of soil must be raised to at least 5.0 before seeding or planting. Seeding should always be accompanied by mulching.

10. In addition to the above requirements, the "Standards for Soil Erosion and Sediment Control" should be met.

7.6 Mitigation Procedures Along Channels

If construction would expose acid producing soil deposits (to air or surface waters) within any channel or riparian zone, the period of exposure should be held to a minimum and measures should be taken to cover such deposits so as to prevent the accelerated oxidation of such deposits. To prepare the plan for covering the acid producing soil deposits, the applicant must implement the use of the following procedure:

1. Spread one (1) foot of soil free of acid producing soil deposits over the exposed deposit surface. The pH of such soil should be 5.0 or greater. The texture of the soil should fall within the following textural classes (US Department of Agriculture, Soil Conservation Service classification):

    - Clay, silty clay, sandy clay, clay loam
    - Silty clay loam, sandy clay loam
    - Loam, silt loam, silt

2. Compact the soil that has been spread pursuant to item 1 above. If vegetation is to be used to stabilize the watercourse banks (see Item 3 below), the soil shall not be compacted to a bulk density exceeding 1.7 grams per cubic centimeter, and the liming and pH requirements of items 7 and 9 of the General Mitigation Procedures shall be met.

3. Prepare a stable channel in a manner consistent with the "Standards for Soil Erosion and Sediment Control." The cover of soil free of acid producing soil deposits shall not be susceptible to appreciable erosion and washout. Where acid

conditions may prevent the establishment of sufficient vegetation, acid-resistant riprap shall be used instead of vegetation. The channel shall be restored to the physical condition existing prior to construction, unless changes to that condition are an integral part of the project.

4. Since the oxidation of sulfide minerals and resulting generations of acid commences as the acid producing soil deposits are exposed, the soil layer should be applied promptly to the newly exposed deposits within or along the channel. To accomplish this, channel excavation should proceed (where necessary) in stages along the successive reach lengths of the channel, scheduled in such a way that no newly exposed acid producing soil deposits remain exposed longer than one week, or the time required for the pH of a well-mixed sample from the uppermost two inches of the deposit to drop to 3.0, whichever is less.

In some places it may not be practical to cover the acid producing soil deposits with a soil-limestone mixture in the manner described above because of steep slopes or because of running water that cannot be diverted during construction. In such cases, plastic liners may be utilized, placing them over the newly exposed acid producing deposit with suitable protection. Any fill material placed over the plastic liner should be free of acid producing soil deposits. (The fill would be held in place over the liner by riprap, concrete walls, or other permanent design features.)

Whenever it is proposed to seal acid producing soil deposits with artificial liners (e.g., plastic or specially prepared bentonite), the applicant must illustrate that the liner would be:

1. Suitably acid-resistant and durable;
2. Protected from erosion and washout;
3. Protected from puncture or tearing due to vehicular or foot traffic, plant growth, riprap, sharp objects, vandalism, or other causes; and
4. Impermeable or very slowly permeable to water movement; and
5. Preventative of release to ground or surface waters of any appreciable quantities of toxic substances leached from the liner or resulting from the chemical or physical deterioration of the liner.

Concrete and asphalt are not suitable liners. However, use of concrete protected by liners from corrosion due to acid producing soil deposits may be given consideration.

7.7 Disposal of Acid Producing soil deposits

Acid producing soil deposits (including earth contaminated with such deposits) that are not backfilled and covered pursuant to sections 7.5 or 7.6 above should be disposed of on or off the construction site in a suitable manner and location. Acid producing soil deposits should not be discharged into watercourses, indiscriminately spread over uncontaminated soil, or sold or distributed as topsoil or topsoil amendments suitable for plant growth. Instead, such deposits should be buried at least two feet beneath the land surface, in such a manner that the cover material is not subject to accelerated erosion. Stockpiles of acid producing soil deposits awaiting burial should be covered with pulverized limestone at the rate of 30 tons per acre (1375 pounds per 1000 square feet) and then covered with a minimum of 12 inches of compacted soil, free of acid producing soil deposits within one week after exposure, or before the pH of a well-mixed sample from the uppermost two inches of the deposit drops to 3.0, whichever occurs first. Whenever practicable, the deposit should be buried the same day it is excavated.

Section 8

Bank Stabilization and Stream Restoration

COMING SOON

The material to be presented in this section is currently under review by Department staff, and it is anticipated that a draft version of this section will be posted on the Department's website in the near future.

The material that will be presented in this section is intended to supplement the standards of the rules and to present various examples and diagrams that will assist applicants in the proper design, construction and maintenance of bank stabilization and stream restoration projects. However, the Flood Hazard Area Control Act rules at N.J.A.C. 7:13-11.14 set forth detailed and prescriptive requirements related to bank stabilization and stream restoration activities. The requirements of the rules should therefore govern the development of any such project, both prior to and after the draft release of guidance under this section.

Section 9

Jurisdiction

9.1 Applicability Determinations

The Flood Hazard Area Control Act rules contain provisions to enable applicants to receive a determination of the applicability of these regulations for a proposed project. Applicability determinations are an optional service the Department provides to persons who want a written determination of whether a particular activity requires a flood hazard area permit. Applicability determinations are recommended in order to avoid unintentionally undertaking unauthorized regulated activities and incurring potential liability. There is no fee for applicability determinations and the procedure for requesting an applicability determination is provided at N.J.A.C. 7:13-5.1

In some cases, the Department will be able to determine that the rules do or do not apply to a proposed activity or that the activity is eligible for a permit-by-rule, or whether a general permit authorization or individual permit must be obtained. However, in certain cases it may not be possible to determine applicability without a verification of the riparian zone, flood hazard area and/or floodway limits. In such a case, the Department will issue a letter stating that applicability is unclear and that a verification must first be obtained in order to determine applicability. Verifications are discussed under 9.2 below.

Workload permitting, the Department will respond to an application for an applicability determination within 30 calendar days. Applicability determinations are issued for five years unless the Department amends the Flood Hazard Area Control Act rules, or changes the flood hazard area or riparian zone onsite, which can affect or nullify the applicability determination. An applicability determination cannot be extended since modifications to regulations may require a re-evaluation of the applicability of this chapter. Applicability determinations can be transferred to a new owner, but doing so does not extend the term of the document.

9.2 Verifications

The Flood Hazard Area Control Act rules provide for a new type of determination that will verify the limits of a flood hazard area, floodway and/or the riparian zone on a particular site. The flood hazard area verification (verification) is similar to a freshwater wetlands letter of interpretation. It is useful to establish the limits of the regulated areas on a site, since these limits demarcate the Department's jurisdiction under these rules. Furthermore, since the design and construction standards differ for activities inside and outside the flood hazard area, floodway and riparian zone, knowing the actual limits of these areas is helpful to both the Department and the regulated community. The application procedures for a verification are set forth at N.J.A.C. 7:13-6.1.

The Department can issue a verification on a site independent of a permit application associated with a construction activity. An applicant may also apply for a verification and an individual permit at the same time. However, pursuant to N.J.A.C. 7:13-9.6, a verification is often required if one plans to obtain an individual permit. In many cases, the Department cannot evaluate whether a proposed activity meets the design and construction standards at N.J.A.C. 7:13-10 and 11 for an individual permit without a determination of the limits of the flood hazard area, floodway and/or riparian zone on a site. This is true because certain standards require a knowledge of the depth of flooding in the flood hazard area and/or the limits of the floodway and riparian zone to determine compliance with a requirement of the chapter. For example, N.J.A.C. 7:13-10.3(b)1 prohibits the construction of a building in a floodway in most cases. If a person proposes to construct a building along a stream, and the Department does not know where the floodway of the stream is located, then the Department cannot evaluate whether the building is proposed within a floodway. In such a case, the Department cannot determine if the building complies with the rules unless the floodway limits are known. Since knowing the floodway limits requires a verification under N.J.A.C. 7:13-6.1, the Department cannot issue an individual permit in such a case without a verification.

This is also true for general permits 5, 6 and 7, which involve constructing habitable buildings in the flood hazard area. The Department must be able to determine that the building is not located in a floodway and that the lowest habitable floor is set one foot above the flood hazard area design flood elevation. Therefore, the Department cannot issue these general permits unless the floodway limits and flood hazard area design flood elevation are known.

Every verification must include the flood hazard area design flood elevation, since this is the basis for drawing the boundaries of the flood hazard area on a site. The elevation must be expressed in feet NGVD, or provide a conversion to NGVD, which is a universally recognized measurement of elevation above a point roughly equal to sea level. Verifications must include a delineation of the flood hazard area limits on the site, unless the entire site lies in a flood hazard area. In such a case, only the flood hazard area design flood elevation will be verified since no flood hazard area boundary actually exists on site. The floodway limits, if they exist onsite, should also be demarcated. A verification request must also include the limits of the riparian zone and all supporting documentation utilized to establish the riparian zone, such as the surface water classification of the water adjacent to and downstream of the site. The flood hazard area design flood elevation, flood hazard area limits and/or floodway limits on a site must be established in accordance with the procedures outlined in N.J.A.C. 7:13-3. Furthermore, the appropriate riparian zone width onsite can be determined as set forth at N.J.A.C. 7:13-4.1. Additional guidance regarding the flood hazard area is provided in Section 2 of this manual.

Verifications are issued for five years and cannot be extended. However, a verification may automatically be reissued in some cases and/or may be transferred to a new owner of the property. If an individual permit or general permit authorization that references or relies upon the verification is issued for the same site, a valid verification is automatically reissued. Verifications issued under general or individual permits are generally valid for five years; however, for very large or complex public projects, a permit and associated verification can be issued for ten years. If a verification is issued concurrently with an individual permit or general permit authorization, the verification must show all alterations to the flood hazard area or floodway limit that will be caused by the permitted activities. Grading and/or filling on a site often raises some areas above the flood hazard area design flood elevation and therefore changes the flood hazard area limits. Similarly, bridges culverts and other water control structures in a channel can alter the floodway limits. Therefore, verifications must show both the existing (pre-construction) and the proposed (post-construction) flood hazard area and floodway limits.

Within 90 calendar days after receiving a verification, the applicant must record the verified flood hazard area and/or floodway limits on the deed for the property. This will ensure that future buyers of the property will be aware that the site may be subject to flooding under various circumstances and will disclose the location of any flood hazard area and/or floodways onsite.

Section 10

Permits-by-Rule

10.1 General Background

A permit-by-rule is a permit whose terms and conditions are set forth in the Flood Hazard Area Control Act rules and for which no prior written approval from the Department is necessary in order to undertake the specified regulated activity, provided all conditions of the permit-by-rule are satisfied. The Department has determined that if the regulated activities are undertaken as prescribed in the respective permits-by-rule, the impact on flooding and the environment will be *de minimis*. (Note that what may be considered a *de minimus* impact under the Flood Hazard Area Control Act rules may not necessarily be considered *de minimus* under the standards of any other applicable regulations.) N.J.A.C. 7:13-2.4 establishes that any construction, grading or removal of riparian zone vegetation requires a permit under this chapter. However, because of the *de minimus* impact of the activities described by the adopted permits-by-rule, an applicant need not obtain a flood hazard area general permit or individual permit prior to the start of construction. Instead, approval for such an activity is already authorized under the permits-by-rule at N.J.A.C. 7:13-7.

10.2 Qualifications for a Permit-by-Rule

The Flood Hazard Area Control Act rules establish a total of 46 permits-by-rule. Each of the permits-by-rule falls within one of six general categories, as described in Table A at N.J.A.C. 7:13-7.1. Note that it is not sufficient to simply rely on this table when determining whether or not a project may be authorized under a permit-by-rule. There are specific criteria for each permit-by-rule, as described in N.J.A.C. 7:13-7.2. When reading through these criteria, it can be seen that there are limits to the scope of work that may fall under each permit-by-rule. Failure of a project to meet all of the standards set forth in a particular permit-by-rule means that said project can not be authorized under that permit-by-rule. In these situations, the applicant must seek approval in the form of a flood hazard area general permit or individual permit.

For example, consider a proposed project consisting of the construction of a fence. Per Table A, it can be seen that this activity could be covered as a permit-by-rule, provided the requirements of N.J.A.C. 7:13-7.2(b)5 are satisfied. Referencing that section, it can be seen that the construction of the fence must meet the following:

i. No disturbance related to the regulated activity is located within 25 feet of any top of bank or edge of water;

ii. No vegetation is cleared, cut or removed in a riparian zone, except where previous development or disturbance has occurred (such as an area maintained as a lawn or garden or an abandoned parking area that has partially revegetated);

iii. All vegetated areas temporarily disturbed within the riparian zone are replanted with indigenous, non-invasive species upon completion of the regulated activity; and

iv. One of the following conditions is satisfied:

    (1) The fence is located outside a floodway; or

    (2) The fence is located in a floodway and has sufficiently large openings so as not to catch debris during a flood and thereby obstruct floodwaters, such as a barbed-wire, split-rail or strand fence. A fence with little or no open area, such as a chain link, lattice or picket fence, does not meet this requirement;

In this example, there are a number of specific requirements beyond what is listed in Table A. The proposed fence must meet four distinct criteria. Failure to meet any of these four will result in the project's failure to qualify for this permit-by-rule. As such, a general permit or individual permit would be required. For example, if the fence would be located within 25 feet of the top of bank, or if previously undisturbed areas of riparian zone vegetation would be permanently removed in order to accommodate its construction, the fence would not qualify for this permit-by-rule. Consequently, if such construction were to commence without a general permit or individual permit, then the applicant would be in violation of the Flood Hazard Area Control Act rules and would be subject to an enforcement action by the Department.

Persons who are unsure of whether a proposed project would qualify for a permit-by-rule are encouraged to obtain an applicability determination from the Department's Division of Land Use Regulation. The procedure for obtaining an applicability determination is set forth at N.J.A.C. 7:13-5.1, and as described in Section 9.1 of this manual.

N.J.A.C. 7:13-7.1(b) also establishes two requirements that apply to all permits-by-rule. The first requirement is that all proposed structures must be suitably anchored. The second requirement relates to the review of detailed engineering calculations. Each permit-by-rule has certain standards that must be met in order for a regulated activity to be authorized. In some cases, the standards are self evident. For instance, a particular permit-by-rule may require that no trees be removed in a riparian zone. In other cases, knowledge of more intricate aspects of certain regulated areas, which are sometimes based on engineering calculations, is required. For example, a particular permit-by-rule may require that no work be situated in a floodway, which necessitates knowledge of the location of the floodway. In some cases, the floodway limits on a site can be easily determined from State or Federal maps. In other cases, determining the floodway limits can require detailed hydraulic calculations. Since applications are not made to the Department for permit-by-rule authorizations, each individual project is not reviewed by the Department. Therefore, there is no opportunity for the Department to verify any calculations that may have been performed in order to demonstrate compliance with a particular permit-by-rule. N.J.A.C. 7:13-7.1(b)1 therefore clarifies that a regulated activity must not require a review of detailed engineering calculations in order for a project to be known to meet the standards of a particular permit-by-rule.

N.J.A.C. 7:13-7.1(e) explains that the total or cumulative impacts of activities that qualify for permits-by-rule must be taken into account. An example is provided in the rules regarding the permit-by-rule to place five cubic yards of fill under proposed N.J.A.C. 7:13-7.2(b)3. The permit-by-rule allows the placement of no more than five cubic yards of fill, so multiple placements of fill that cumulatively do not exceed five cubic yards are also permitted-by-rule. For example, a person could place one cubic yard of fill per month for five months and be covered under this permit-by-rule. However, any additional fill placed after the limit is reached, no matter how small, is not permitted-by-rule and requires an individual permit or general permit authorization.

N.J.A.C. 7:13-7.1(e) also explains that a project can be approved under multiple permits-by-rule and still be authorized under this section, provided no individual activity is undertaken that does not qualify for one of the proposed permits-by-rule. For example, a person could (on the same site and at the same time) elevate a building under the permit-by-rule at N.J.A.C. 7:13-7.2(a)3, construct an addition to the building under the permit-by-rule at N.J.A.C. 7:13-7.2(a)4, and build a fence around the building under the permit-by-rule at N.J.A.C. 7:13-7.2(b)5, without requiring another approval under this chapter, provided each activity meets the descriptions of each applicable permit-by-rule.

10.3 Obtaining a Permit-by-Rule

As mentioned earlier in this section, Table A organizes the 46 permits-by-rule into six distinct categories. Furthermore, as explained in N.J.A.C. 7:13-7.1(d), the Department need not be noticed for most of the permit-by-rule activities. There are, however, a group of eight permits-by-rule for which the Department requires prior notification. These are set forth at N.J.A.C. 7:13-7.2(a). The Department must be notified 14 days prior to the start of construction. This notification may be made via letter, electronic mail, fax or in person. Notification must be made to the Bureau of Coastal and Land Use Compliance and Enforcement, not the Division of Land Use Regulation. The notice requirements are specified in N.J.A.C. 7:13-7.1(d). Once notice to the Department is made, the work may begin in 14 days without further approval or acknowledgment from the Department. As long as the specific project is completely covered under one of the 46 permits-by-rule, then the permit-by-rule is considered automatic, and nothing further is required under the

Flood Hazard Area Control Act rules. Note that activities that exceed the limitations of a given permit-by-rule, if undertaken without an approved general permit or individual permit, will subject the responsible party to enforcement action under N.J.A.C. 7:13-19.

10.4 Permits-by-Rule and Other Regulations

It is important to understand that the permits-by-rule specified under N.J.A.C. 7:13-7 only address the standards relating specifically to the Flood Hazard Area Control Act rules. They do not negate the need for the applicant to obtain any other State or local permits which may be needed prior to the start of construction. A project that meets a flood hazard area permit-by-rule may still need an additional freshwater wetlands, CAFRA or waterfront development approval from the Department.

For example, revisiting the earlier example of the proposed fence, if all the requirements of N.J.A.C. 7:13-7.2(b)5 are satisfied, then no further flood hazard area approval is required. However, if the fence is proposed to be located in a freshwater wetland or associated transition area, then the applicant would have to first obtain the appropriate authorization under the Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A. In so doing, if the project changes as a result of obtaining this authorization and no longer qualifies for a permit-by-rule, then a flood hazard area general permit or individual permit would also be required.

Section 11

General Permits

11.1 General Provisions

The Flood Hazard Area Control Act rules include general permits for 16 specific construction activities set forth at N.J.A.C. 7:13-8. These general permits are designed to facilitate various activities that have been identified as having minimal impacts to flooding and the environment. General permit 1 allows local governments to remove sediment and debris from channels, pursuant to the "Stream Cleaning Act" at N.J.S.A. 58:16A-67. Seven general permits (2A through 2G) are specifically targeted for projects that are designed and overseen by the NRCS. General permit 3 allows public entities to provide scour protection for bridges along public roadways, and general permit 4 allows public entities to maintain and repair stormwater structures. General permit 5 allows the relocation of a building to reduce flood damage potential, and general permit 6 allows the reconstruction of a private residence damaged or destroyed by fire, flood or other natural disaster. General permit 7 allows the construction of a private residence, a residential addition or a structure appurtenant to a residence in a tidal flood hazard area. General permits 8, 9 and 10 apply to certain projects along waters that drain less than 50 acres, provided a freshwater wetlands general permit has already been approved for the work. Specifically, general permit 8 allows the construction of a utility line, general permit 9 allows the construction of a roadway or footbridge, and general permit 10 allows the construction of a stormwater outfall structure.

No public notice is required for an application for a general permit authorization and the application fee for a general permit is $500.00 (except for general permits 1 and 6 at N.J.A.C. 7:13-8.3 and 8.8, respectively, for which there is no application fee). A 45-day review period applies to general permit applications, except for general permit 1 at N.J.A.C. 7:13-8.3, which has either a 15-day or 60-day review. An authorization under a general permit will be automatically approved if the Department does not reject or deny the application within 45 days of the receipt of a complete application.

It is important to note that multiple or repeated activities on a site, which may individually qualify for authorization under a general permit, require an individual permit if the cumulative impacts exceed any limit contained in the applicable general permit.

N.J.A.C. 7:13-8.1(b) sets forth several basic conditions that apply to all general permits, such as a requirement that the activity must not adversely affect fishery resources and threatened or endangered species, that all structures be suitably anchored, that appropriate soil conservation methods are practiced and that the local Soil Conservation District approves the project if they have jurisdiction over the activities. N.J.A.C. 7:13-8.1(b)7 requires either that the overall project associated with the general permit activity is not subject to the requirements of the Stormwater Management rules at N.J.A.C. 7:8, or else that the overall project has already been reviewed and approved under a Land Use permit, during which review the Department has determined that the overall project meets the requirements of N.J.A.C. 7:8. Any activity that requires a review of stormwater management calculations to determine compliance with N.J.A.C. 7:8 is not eligible for a general permit under this chapter.

N.J.A.C. 7:13-8.1(c) sets forth the application review material that must be submitted to the Department in order to demonstrate that the limitations and requirements of the general permit are satisfied. This subsection does not apply to general permit 1, the application and review procedures for which are described at N.J.A.C. 7:13-8.3. The required material includes an application report, as described at N.J.A.C. 7:13-15.3, which includes basic information relating to the location of the site and who will be performing the work. Drawings of the project illustrating the work and any impacts to the riparian zone must be provided, as must a certification from an engineer.

11.2 Engineer's Certification

The engineer's certification described at N.J.A.C. 7:13-8.1(c)1 details how the project meets the requirements of the particular general permit under which authorization is sought. The appropriate certification form for each general permit is provided below.

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 1
Desnagging of a Channel and/or Removal of Accumulated Sediment, Debris and Garbage Obstructing Flow in a Channel

Project Description ____

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Lot ______________________ Block ______________________

Municipality __________________ County ____________________

Name of Applicant ____
Address ____
Phone Number ____

Engineer ____
Address ____
Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The applicant is a county, municipality or a designated agency thereof.

☐ The project's sole purpose is to remove obstructions to flow or desnag a channel.

☐ The project is necessary and in the public interest.

☐ The project consists solely of either:
i. The removal of accumulated silt, sediment, debris and/or garbage from a channel with a natural bed. This general permit does not authorize removal of material below the natural bed of the channel; or
ii. The removal of any accumulated material from a channel previously lined with concrete or similar artificial material.

☐ The project does not disturb the channel bank or the riparian zone, unless such disturbance is unavoidable, necessary to gain access to the channel and minimized.

☐ The project does not alter the natural banks of the channel. This general permit does not authorize the straightening or realignment of a channel. Straightening or realignment constitutes channel modification and requires an individual permit pursuant to N.J.A.C. 7:13-10.1(c).

☐ The project is conducted from only one bank where possible.

☐ The use of heavy equipment in the channel is avoided.

☐ Vegetation and tree canopy on the more southerly or westerly bank is preserved in order to shade the channel.

☐ If the project involves sediment removal from a channel with a natural bed, the following requirements are satisfied:
i. The channel reach is less than 500 feet in length;
ii. The channel bed does not exceed 15 feet in average width;
iii. The channel has a documented history of severe flooding that has resulted or can result in property damage, therefore necessitating the proposed cleaning, clearing or desnagging;
iv. The channel is not classified as a Pinelands water or Category One water under the Department's Surface Water Quality Standards at N.J.A.C. 7:9B; and
v. The channel is not a documented habitat for threatened or endangered species.

☐ All materials, including dredged material, removed from a channel during activities authorized under this general permit shall be disposed of outside of any regulated area and also any freshwater wetlands, transition areas and State open waters, as those terms are defined in the Department's Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A-1.4, unless the applicant demonstrates that this would cause more environmental harm or flooding risk than disposing of the material in these areas. For example, if removal of dredged material requires construction of a long temporary roadway through a very wet area to enable trucks to transport the dredged material offsite, this might cause more environmental harm than using a large blower to spread the dredged material thinly over a large area.

I hereby certify that the above statements are true

Name ____ License No. __________________

Signature ____ Date __________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2A
Soil Erosion Control, Bank Stabilization or Bank Restoration for Agricultural Activities Designed by NRCS

Project Description ____

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Lot ___________________________ Block _________________________

Municipality ____________________ County ________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The activities occur on land that is actively farmed.

☐ The activities are solely intended for agricultural purposes.

☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

☐ The project will be accomplished by re-sloping the eroded bank and planting vegetation where possible. Where these techniques alone will not stabilize erosion, or where more than 2,000 square feet of trees would be cleared, cut or removed using such methods, soil bioengineering, shall be used.

☐ Disturbance to vegetation within the riparian zone is minimized.

☐ The cross-sectional area of the channel will not be significantly altered.

☐ The activity will not obstruct flow in the channel or floodway.

☐ All cleared, cut or removed vegetation in the riparian zone will be replanted with indigenous, non-invasive vegetation, except where the removed vegetation has been replaced by non-vegetative stabilizing material.

I hereby certify that the above statements are true

Name ___________________________________ License No. _________________

Signature _____________________________________ Date _________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2B
Removal of Accumulated Silt, Sediment, Debris and/or Garbage from a Regulated Water for Agricultural Activities Designed by NRCS

Project Description ____

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Lot ____________________________ Block _________________________

Municipality ____________________ County _______________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

- ☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

- ☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
  i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
  ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

- ☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

- ☐ The activities occur on land that is actively farmed.

- ☐ The activities are solely intended for agricultural purposes.

- ☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

- ☐ Excavation does not extend below the natural bed or alter the natural banks.

- ☐ The project does not include straightening or realignment of a channel.

- ☐ The project does not disturb the channel bank or the riparian zone, unless such disturbance is unavoidable, necessary to gain access to the channel and minimized.

- ☐ The project is conducted from only one bank where possible.

- ☐ All heavy machinery necessary for the conduct of the project is situated outside the channel. Heavy machinery may reach into the channel to dredge, but will not be driven into or operated within the channel.

- ☐ Vegetation and tree canopy on the more southerly or westerly bank is preserved in order to shade the channel.

- ☐ All proposed access points to the water are described in writing and with color photographs.

- ☐ All disturbed areas in the riparian zone are replanted with indigenous, non-invasive vegetation upon completion of the project.

- ☐ All removed sediment is disposed of in accordance with all applicable Federal, State and local laws. If the removed sediment is to remain in the flood hazard area, it is spread evenly at least 25 feet from any top of bank or edge of water and, if in a floodway, no more than three inches deep.

- ☐ The placement of the removed sediment does not interfere with the positive overland drainage of the receiving area.

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ________________________________ Date ______________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2C

Construction of a Roadway Across a Regulated Water for Agricultural Activities Designed by NRCS

Project Description ____

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Lot ___________________________ Block _________________________

Municipality ____________________ County _______________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or

ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The activities occur on land that is actively farmed.

☐ The activities are solely intended for agricultural purposes.

☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

☐ Construction in the channel is minimized and unset or raw cement is not allowed to come into contact with water in the channel during construction.

☐ If the crossing is accomplished with a culvert, the culvert is stabilized with headwalls that have footings which extend at least three feet below grade, and which will prevent the culvert from displacement during the flood hazard area design flood.

☐ If the crossing is accomplished with a bridge, the bridge is constructed with abutments that have footings which extend at least three feet below grade, and which will prevent the bridge from displacement during the flood hazard area design flood.

☐ The proposed roadway surface and all embankments are designed to remain stable during the flood hazard area design flood.

☐ The perpendicular path of disturbance through the riparian zone is no more than 25 feet in width.

☐ It is clear to the Department from a visual inspection of submitted drawings that the proposed roadway crossing will not increase flooding offsite.

I hereby certify that the above statements are true

Name ________________________________ License No. ________________

Signature __________________________________ Date ________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2D
Filling of a Manmade Regulated Water for Freshwater Wetlands Restoration for Agricultural Activities Designed by NRCS

Project Description ____

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Lot ______________________________ Block ___________________________

Municipality ______________________ County __________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

- ☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

- ☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
  - i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
  - ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

- ☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

- ☐ The activities occur on land that is actively farmed.

- ☐ The activities are solely intended for agricultural purposes.

- ☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

- ☐ The regulated water originates onsite.

- ☐ The filling of the regulated water will not adversely affect overland drainage on adjoining properties.

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ________________________________ Date ______________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2E
Creation of a Ford for Livestock Crossing Across a Regulated Water for Agricultural Activities Designed by NRCS

Project Description ____

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Lot __________________________ Block _______________________

Municipality ___________________ County ______________________

Name of Applicant _______________________________________
Address ____
Phone Number ____

Engineer ____
Address ____
Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The activities occur on land that is actively farmed.

☐ The activities are solely intended for agricultural purposes.

☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

☐ Livestock currently cross the regulated water on a regular basis.

☐ The creation of a stable ford will reduce ongoing damage to the channel caused by the existing access to the channel by livestock.

☐ No trees are cleared, cut or removed in a riparian zone.

☐ The ford is situated at or below the existing channel bed so that the ford will not obstruct flow.

☐ The perpendicular path of disturbance through the riparian zone is no more than 20 feet in width.

☐ The ford is designed to remain stable during the flood hazard area design flood.

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ______________________________ Date ______________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2F
Construction of a Fence Along and/or Across a Regulated Water to Limit or Manage Livestock Access to a Channel, or to Prevent Livestock or Other Animals from Accessing Certain Agricultural Areas

Project Description ____

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Lot ______________________________ Block ___________________________

Municipality ______________________ County __________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

as Designed by NRCS

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
   i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
   ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The activities occur on land that is actively farmed.

☐ The activities are solely intended for agricultural purposes.

☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

☐ No trees are cleared, cut or removed in a riparian zone.

☐ The fence is placed parallel to the channel where possible.

☐ If the fence crosses a channel and/or is located in a floodway, it has sufficiently large openings so as not to catch debris during a flood and thereby obstruct floodwaters, such as a barbed-wire, split-rail or strand fence. A fence with little or no open area, such as a chain link, lattice or picket fence, is not permitted across a channel or in a floodway.

☐ The fence will not impede bank-full flow in the channel.

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ______________________________ Date ______________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 2G
Construction of a Pump and/or Water Intake Structure in or along a Regulated Water, in Order to Provide Water for Livestock Outside the Channel as Designed by NRCS

Project Description ____

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Lot ____________________________ Block _________________________

Municipality ____________________ County ________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The activities occur on land that is actively farmed.

☐ The activities are solely intended for agricultural purposes.

☐ The activities are approved by and performed under the supervision of the USDA Natural Resource Conservation Service and/or local soil conservation district, as appropriate.

☐ No trees are cleared, cut or removed in a riparian zone.

☐ Fill within the flood hazard area is minimized.

☐ The pump or structure will not impede bank-full flow in the channel.

I hereby certify that the above statements are true

Name ______________________________________ License No. __________________

Signature ____ Date __________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 3

Bridge or Culvert Scour Protection by a Public Entity

Project Description ____
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Lot ______________________________ Block __________________________

Municipality ______________________ County __________________________

Name of Applicant ____
Address ____
Phone Number ____

Engineer ____
Address ____
Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or

ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The project is approved by and performed under the supervision of a public entity.

☐ The project is necessary for the maintenance and/or protection of an existing bridge or culvert along a public roadway.

☐ The stabilizing material placed in the channel is in the same location as the material that has eroded away since the bridge or culvert was originally constructed. This stabilizing material can be placed within any open void area that has been created by previous scour in the channel, and/or can replace any unconsolidated material in the channel, such as silt or sediment, which has subsequently been deposited in any such void area.

☐ The amount of stabilizing material placed in the channel is no greater than necessary to replace the material that has eroded away (and which may have subsequently been replaced by unconsolidated material) since the bridge or culvert was originally constructed.

☐ The stabilizing material consists of, or is covered by, indigenous substrate where possible.

☐ The stabilizing material does not obstruct flow in the channel or floodway.

☐ The project does not disturb the channel bank or the riparian zone, unless such disturbance is unavoidable, necessary to gain access to the channel and minimized. If access to the channel results in topographic changes to the bank, such as ruts from trucks or other machinery, the grade of the bank will be restored to its pre-construction topography where possible.

☐ All cleared, cut or removed vegetation in the riparian zone will be replanted with indigenous, non-invasive vegetation, except where the removed vegetation has been replaced by the stabilizing material.

☐ Every effort will be made to perform the activity from only one bank.

☐ Vegetation and canopy on the more southerly or westerly bank will be preserved for shading of the water where possible.

I hereby certify that the above statements are true

Name ______________________________________ License No. __________________

Signature ____ Date __________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 4
Stormwater Maintenance by a Public Entity

Project Description ____

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Lot ____________________________ Block __________________________

Municipality _____________________ County _________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The maintenance is approved by and performed under the supervision of a public entity.

☐ The maintenance occurs within and is necessary for the maintenance of a lawfully existing, manmade conveyance structure or drainage feature, such as a pipe, culvert, ditch, channel or basin, not including natural channels that were previously modified.

☐ The maintenance involves one or more of the following:

i. The removal of accumulated sediment, debris or nuisance vegetation;
ii. The stabilization of an eroded structure; and/or
iii. The reconstruction, repair and/or in-kind replacement of any:
   (1) Culvert along a manmade channel;
   (2) Stormwater pipe, manhole, inlet, catch basin;
   (3) Headwall, discharge structure or associated conduit outlet protection; and/or
   (4) Tidegate, levee or pump station along a water that is separated from tidal influence by these structures.

☐ Disturbance to vegetation in the riparian zone is minimized.

☐ All temporarily cleared, cut or removed vegetation in the riparian zone is replanted with indigenous, non-invasive vegetation.

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ______________________________ Date ______________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 5
Relocation of a Building to Reduce Flood Damage

Project Description ____

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Lot ______________________________ Block ___________________________

Municipality ______________________ County __________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

- ☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.
- ☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.
- ☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.
- ☐ All structures are suitably anchored.
- ☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.
- ☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ Where possible, the building has been moved further from the regulated water and to higher ground on the same site.

☐ The building is not being enlarged (except for an addition that meets a permit-by-rule at N.J.A.C. 7:13-7.2).

☐ The building is not located in a floodway (either before or after relocation).

☐ The lowest finished floor of the building is raised to at least one foot above the flood hazard area design flood elevation.

☐ The area below the lowest finished floor of the building is not used for habitation and remains open to floodwaters, in accordance with N.J.A.C. 7:13-11.5(l).

☐ The proposed location of the building is situated outside the riparian zone if a suitable location exists on the same site. Otherwise, the removal of trees within the riparian zone has been be minimized to accommodate the new building location.

☐ No vegetation is being cleared, cut or removed in a riparian zone, except for vegetation within 20 feet of the existing and/or proposed building if such disturbance is necessary to facilitate its relocation. In such a case, all temporarily disturbed areas shall be replanted with indigenous, non-invasive vegetation upon completion of the project, including the area where the relocated building originally existed.

☐ The flood hazard area design flood elevation and floodway limits are known in order to determine compliance with this general permit authorization. (Note: If the flood hazard area design flood elevation and/or floodway limits can be determined using Methods 1, 2 or 3 (at N.J.A.C. 7:13-3.3, 3.4(d) and 3.4(e), respectively), then a verification pursuant to N.J.A.C. 7:13-6.1 does not need to be obtained prior to obtaining authorization under this general permit authorization. However, if the flood hazard area design flood elevation and/or floodway limits are determined using Methods 4, 5 or 6 (at N.J.A.C. 7:13-3.4(f), 3.5 and 3.6, respectively), then a verification pursuant to N.J.A.C. 7:13-6.1 must be obtained from the Department prior to, or concurrent with, obtaining authorization under this general permit.)

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ______________________________ Date ______________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 6
Reconstruction of a damaged or destroyed residence

Project Description ____

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Lot ____________________ Block ____________________

Municipality ____________________ County ____________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The residence has been damaged or destroyed by fire, flood or other natural disaster within one year prior to application to the Department under this general permit authorization.

☐ The new residence is constructed within the footprint of the residence that was damaged or destroyed or is moved further from the regulated water to higher ground onsite.

☐ The residence is not enlarged (except for an addition that meets a permit-by-rule at N.J.A.C. 7:13-7.2).

☐ The residence is not located in a floodway (either before or after reconstruction).

☐ The lowest finished floor of the new residence is constructed at least one foot above the flood hazard area design flood elevation.

☐ The area below the lowest finished floor of the residence is not used for habitation and remains open to floodwaters, in accordance with N.J.A.C. 7:13-11.5(l).

☐ If the residence is to be moved, it is situated outside the riparian zone if a suitable location exists on the same site. Otherwise the removal of trees within the riparian zone shall be minimized to accommodate the new building location.

☐ No vegetation will be cleared, cut or removed in a riparian zone, except for vegetation within 20 feet of the existing and/or proposed residence if such disturbance is necessary to facilitate its reconstruction. In such a case all temporarily disturbed areas shall be replanted with indigenous, non-invasive vegetation upon completion of the project including, if the residence is relocated, the area where the residence originally existed.

☐ The flood hazard area design flood elevation and floodway limits are known in order to determine compliance with this general permit authorization. (Note: If the flood hazard area design flood elevation and/or floodway limits can be determined using Methods 1, 2 or 3 (at N.J.A.C. 7:13-3.3, 3.4(d) and 3.4(e), respectively), then a verification pursuant to N.J.A.C. 7:13-6.1 does not need to be obtained prior to obtaining authorization under this general permit. However, if the flood hazard area design flood elevation and/or floodway limits are determined using Methods 4, 5 or 6 (at N.J.A.C. 7:13-3.4(f), 3.5 and 3.6, respectively), then a verification pursuant to N.J.A.C. 7:13-6.1 must be obtained from the Department prior to, or concurrent with, obtaining authorization under this general permit.)

I hereby certify that the above statements are true

Name ______________________________________ License No. __________________

Signature ____ Date __________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 7
Residential Construction in a Tidal Flood Hazard Area

Project Description ____

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Lot ____________________ Block ____________________

Municipality ____________________ County ____________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
  i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
  ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ If the regulated activity is proposed in a regulated area known or suspected to contain acid producing soils, a plan is established and implemented to minimize the adverse effects of exposing these soils as described at N.J.A.C. 7:13-10.7.

☐ The applicant is proposing one of the following:
1. One new private residence, which is not being constructed as part of a larger residential subdivision;
2. An addition to a private residence; and/or
3. A building appurtenant to a private residence, such as a garage, barn or shed.

☐ The project is located in a tidal flood hazard area.

☐ The project does not require a CAFRA or waterfront development permit under N.J.A.C. 7:7 and 7:7E.

☐ The project meets the requirements for disturbance in the riparian zone at N.J.A.C. 7:13-10.2, including any justification that may be required for the activity and any limitations on the area of vegetation that can be cleared, cut or removed in the riparian zone.

☐ The project meets the applicable requirements for a building at N.J.A.C. 7:13-11.5.

☐ The flood hazard area design flood elevation and floodway limits are known in order to determine compliance with this general permit. (Note: If the flood hazard area design flood elevation and/or floodway limits can be determined using Methods 1, 2 or 3 (at N.J.A.C. 7:13-3.3, 3.4(d) and 3.4(e), respectively), then a verification pursuant to N.J.A.C. 7:13-6.1 does not need to be obtained prior to obtaining authorization under this general permit. However, if the flood hazard area design flood elevation and/or floodway limits are determined using Methods 4, 5 or 6 (at N.J.A.C. 7:13-3.4(f), 3.5 and 3.6, respectively), then a verification pursuant to N.J.A.C. 7:13-6.1 must be obtained from the Department prior to, or concurrent with, obtaining authorization under this general permit.)

I hereby certify that the above statements are true

Name ______________________________________ License No. __________________

Signature ____ Date __________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 8
Utility Line Across or Along a Regulated Water with a
Drainage Area of Less than 50 Acres

Project Description ____

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Lot ____________________________ Block __________________________

Municipality ____________________ County _________________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:
   i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
   ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ The project is located across or along a regulated water that has a drainage area of less than 50 acres.

☐ The project is not located in the flood hazard area or riparian zone of another regulated water that has a drainage area of 50 acres or greater.

☐ The project is authorized under a valid freshwater wetlands general permit 2 or 21, pursuant to N.J.A.C. 7:7A-5.2 or 5.21, respectively.

☐ The project meets the requirements for disturbance in the riparian zone at N.J.A.C. 7:13-10.2, including any justification that may be required for the activity and any limitations on the area of vegetation that can be cleared, cut or removed in the riparian zone.

☐ The project meets the requirements at N.J.A.C. 7:13-11.9 for the construction of a utility line.

I hereby certify that the above statements are true

Name ________________________________ License No. ________________

Signature __________________________________ Date ________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:

Flood Hazard Area General Permit 9

Roadway or Footbridge Across a Water with a Drainage Area of Less than 50 Acres

Project Description ____

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Lot ______________________ Block ______________________

Municipality ______________________ County ______________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or

ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ It crosses a regulated water that has a drainage area of less than 50 acres.

☐ It is not located in the flood hazard area or riparian zone of another regulated water that has a drainage area of 50 acres or greater.

☐ It is authorized under a valid freshwater wetlands general permit 10A or 10B, pursuant to N.J.A.C. 7:7A-5.10A or 5.10B, respectively.

☐ It meets the requirements for disturbance in the riparian zone at N.J.A.C. 7:13-10.2, including any justification that may be required for the activity and any limitations on the area of vegetation that can be cleared, cut or removed in the riparian zone.

☐ It meets the requirements at N.J.A.C. 7:13-11.7(e) through (l) for the protection of aquatic habitat and the maintenance of low-flow aquatic passage.

I hereby certify that the above statements are true

Name ______________________________________ License No. __________________

Signature ____ Date __________________

NJDEP Division of Land Use Regulation
Certification of Compliance with:
Flood Hazard Area General Permit 10
Stormwater Outfall Along a Water with a Drainage Area of Less than 50 Acres

Project Description ____

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Lot ____________________________ Block _________________________

Municipality ____________________ County _______________________

Name of Applicant ____

Address ____

Phone Number ____

Engineer ____

Address ____

Phone Number ____

☐ The regulated activity is not undertaken in the channel or riparian zone of a regulated water with fishery resources during a restricted time period as described at N.J.A.C. 7:13-10.5(d), unless otherwise approved by the Department's Division of Fish and Wildlife.

☐ The regulated activity does not adversely affect low-flow aquatic passage within any regulated water.

☐ The regulated activity will not adversely affect a threatened or endangered species, or a documented habitat for a threatened or endangered species.

☐ All structures are suitably anchored.

☐ The regulated activity is performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

☐ Prior to undertaking the regulated activity, all necessary approvals will be obtained from the local Soil Conservation District or their designee.

☐ The regulated activity does not require review for compliance with the Stormwater Management rules at N.J.A.C. 7:8 because:

i. The overall project with which the general permit activity is associated is not a major development, as defined at N.J.A.C. 7:8-1.2; or
ii. The Department has already determined through the approval of a CAFRA, Waterfront Development or Freshwater Wetlands Protection Act permit that the overall project with which the general permit activity is associated complies with the Stormwater Management rules at N.J.A.C. 7:8.

☐ It is located along a regulated water that has a drainage area of less than 50 acres.

☐ It is not located in the flood hazard area or riparian zone of another regulated water that has a drainage area of 50 acres or greater.

☐ It is authorized under a valid freshwater wetlands general permit 11, pursuant to N.J.A.C. 7:7A-5.11.

☐ It meets the requirements for disturbance in the riparian zone at N.J.A.C. 7:13-10.2, including any justification that may be required for the activity and any limitations on the area of vegetation that can be cleared, cut or removed in the riparian zone.

☐ It meets the requirements at N.J.A.C. 7:13-11.10 for the construction of a stormwater outfall structure.

I hereby certify that the above statements are true

Name ______________________________ License No. ______________

Signature ________________________________ Date ______________

Section 12

Application Requirements

12.1 General Provisions

Each section of the Flood Hazard Area Control Act rules prescribes specific performance standards that must be met before the Department may approve any application. This section of the technical manual presents the standards for the presentation of materials and discussions to be used in support of a flood hazard application and serves to supplement N.J.A.C. 7:13-15. All applications must contain both administrative and technical information, as set forth in the rules and explained below. Without all the required information, the Department will not be able to accept an application for review. In certain cases, an applicant must obtain multiple permits from the Department. Under these circumstances, applicants are encouraged to submit a consolidated application for the multiple permits.

12.2 Pre-Application Conference

When guidance for a particular proposed project is sought prior to submission of an application, an applicant may request a pre-application conference with the Department. Such a conference is recommended for large or complicated projects. Any request may be made in writing via mail or email, or over the telephone.

Prior to scheduling a pre-application conference, the Department may request that the applicant submit a set of drawings depicting the proposed development and an application report, as described at N.J.A.C. 7:13-15.3, if the Department determines that such information is necessary to properly advise the applicant regarding the proposed project and application procedures. The information contained in an application report enables the Department to be better prepared for a pre-application conference, which often saves the applicant and the Department both time and effort.

At a pre-application conference, Department staff will discuss various requirements of this chapter as they relate to a project and may offer guidance to assist the applicant. However, no discussion or guidance offered at a pre-application conference shall compel the Department to approve or deny an application

In order to maximize the benefit of the pre-application conference, the Department recommends that the applicant perform necessary due diligence as it relates to the location of the flood hazard area and the width of the riparian zone. In addition, the applicant is encouraged to investigate the presence and location of freshwater or coastal wetlands, any associated buffers thereto, as well as the existence of any grants, easements or deed restrictions held against the subject property that may impact the proposed work. By taking the time to investigate such issues prior to scheduling a pre-application conference, design constraints may be better known ahead of time. This will lead to a more productive conference.

A pre-application conference may be held over the telephone or at a face-to-face meeting with the Department in its Trenton office. The type of conference held will, in large part, be a function of the complexity of the relevant issues pertaining to a particular site, and will be at the Department's discretion. If questions concerning the proposed site design are only general in nature, the Department may instead address the request for a pre-application conference via telephone. In many cases, applicants and their professionals are often better served by referring to the text of the Flood Hazard Area Control Act rules for general inquiries, since the rules are quite prescriptive and set forth design and construction requirements in great detail.

12.3 Application Report

All flood hazard area applications must contain basic information about the applicant and the site in question so that the Department can understand the essentials of the project and the site in question. Without this information, applications are not eligible for review by the Department and will be rejected. This information is should be included in an application report, as described at N.J.A.C. 7:13-15.3, three copies of which should be submitted.

The Department requires the application report to contain the following information. Each of these items is discussed in detail below.

- A written project description
- A completed LURP2 form
- A copy of the USGS map
- A copy of the tax map
- A copy of any available flood map
- A copy of any prior Department approvals or denials on the site
- Color photographs

Project Description

The applicant must submit a project narrative. This is a specific description including the current land use/land coverage of the site, the size of the site, and the goal of the proposed project. The description should contain a list of each of the project elements regulated under the Flood Hazard Area Control Act rules and cite the relevant section of the rules corresponding to that particular project element. The project description should contain a list of the environmental constraints on the site, including reference to the limits of both the flood hazard area and floodway and how these limits were determined, the width of the riparian zone and how this width was determined, the presence of any freshwater wetlands and associated transition areas and how these limits were determined, and any easements or deed restricted areas held against the site.

LURP2 Form

The LURP2 form is the main administrative form used by the Division of Land Use Regulation to identify a site and all relevant parties. The form may be downloaded from the Division's website at www.nj.gov/dep/landuse. In completing this form, all contact information for the applicant and his or her agent (if applicable) must be submitted, including name, address, telephone number, fax number and email address, as appropriate. Similarly, the location information in terms of lot and block, State plane coordinates and a street address for the site under consideration must be included, with a brief project statement. In addition, the type of permit sought must be checked in the appropriate box. This will either be a verification, general permit or individual permit. Finally, professional certification is required. The applicant, agent and property owner must all sign this form. It is important that the owners of all properties upon which a proposed project is located sign the LURP2 form. Without these signatures, the Department will be unable to accept an application for review or issue any approvals under this chapter.

Location Maps

The applicant must submit a scaled, color version of the USGS quadrangle map. On this map, a scaled outline of the property in question must be included. In addition, a copy of the tax map of the property must be submitted with the property limits similarly depicted. Finally, a copy of Department flood hazard area map or FEMA flood insurance rate map, with the site clearly outlined to scale, must also be submitted, if such mapping exists.

Past Approval History

The application report must also include a copy of all prior Department actions on the subject property. This includes any Land Use approvals, withdrawals, or denials issued for the site, as well as the date of these actions. This also includes other Departmental actions on site that are relevant to the proposed construction on site, including, but not limited to any correspondences from the Department's Site

Remediation Program, State Historic Preservation Office, Division of Watershed Management and Bureau of Dam Safety and Flood Control. This section of the report should also make mention of any recorded deed restrictions, as well as providing copies of the actual restriction documents, filed on the site.

Color Photographs

Each copy of the application report must contain color photographs of the site in question. These photographs must be mounted on 8.5-inch by 11-inch paper. The number of photographs for each site is at the discretion of the individual preparing the application report. However, at a minimum, the photographs should clearly depict the existing condition of the site in general, with additional specific photographs of each of the regulated areas to be disturbed. For example, if the applicant proposes to delineate the limit of the flood hazard area, then photographs should be taken at each stream cross section used in the hydraulic analysis to depict the condition of the watercourse. Similarly, if the applicant proposes to stabilize a stream, then photographs should be taken in each area proposed to be stabilized. Additional photographs should be taken for the sections of the watercourse wherein no disturbance is proposed for reference. Finally, if the applicant proposes disturbance within the riparian zone, then photographs outlining the condition of the riparian zone in the area of proposed disturbance should be included.

In addition to the above, a photograph location key must be submitted. The key should show the location of all submitted photographs and should indicate the direction in which the photographs are facing. Current color aerial photographs may be included to supplement the site photographs. However, aerial photographs may not substitute for the required site photographs.

12.4 Additional Application Material

Checklists

Checklists are available for download at www.nj.gov/dep/landuse. The appropriate checklist to be completed and submitted depends upon whether or not the requested permit is a general permit or an individual permit, or if a flood hazard verification is requested. The appropriate checklist must be completed and submitted as part of the application package.

Please note that for most flood hazard area applications, the applicant is required to obtain correspondence from the Department’s Natural Heritage Program with respect to the existence of threatened or endangered species either on the project site or within the project vicinity. Information on how to obtain this correspondence may be found at: www.nj.gov/dep/parksandforests/natural/heritage.

Notices

Most flood hazard area verification and individual permit applications require that the public be notified of proposed application prior to submission to the Department, in accordance with N.J.A.C. 7:13-16. Proof of notice must be included in the application package. This proof must consist of a certified list of property owners, available from the municipal clerk, a copy of the certified return receipts, each mounted on 8.5-inch by 11-inch paper, as well as a copy of a sample notification letter. Certified mailing receipts that are not mounted are easily lost and will therefore not be accepted for review.

Application Fees

Most flood hazard area verification, general permits and individual permit applications require the applicant to submit a projects review fee in accordance with N.J.A.C. 7:13-17. General permits 1 and 6 do not require an application fee. Furthermore, the $500.00 fee normally charged for verifications based on methods 1, 2, 3 and 5 does not apply if the verification application is submitted concurrently with either of the following:

1. An application for any general permit authorization for which verification of the flood hazard area is required to determine compliance with the general permit; or
2. An individual permit application solely for the construction of one private residence (which is not being constructed as part of a larger residential subdivision), the construction of a residential addition and/or the construction of a building appurtenant to a private residence, such as a garage, barn or shed.

All application fees shall be paid by money order, check (personal, bank, certified or attorney) or government purchase order. Fees shall be made payable to the "Treasurer, State of New Jersey."

List of Attachments

The applicant must submit engineering drawings, an engineering report, an environmental report, and a stormwater management report (when the proposed project is classified as a major development per N.J.A.C. 7:8). These documents should listed by reference in the application package as a series of attachments, and should be signed and sealed by a New Jersey licensed professional engineer as appropriate.

12.5 Engineering Report

Any flood hazard area verification or individual permit application, which requires the Department to review engineering calculations in order to determine compliance with the requirements of the Flood Hazard Area Control Act rules, requires an engineering report in accordance with N.J.A.C. 7:13-15.4. The required engineering report should be a bound, signed and sealed document. It should open with a brief project description outlining the elements of the project regulated under the Flood Hazard Area Control Act rules. It should also contain a summary table demonstrating compliance with each of the applicable standards. For example, if an applicant proposes to place fill within the flood fringe outside of the Central Passaic Basin, then the summary table should identify the flood fringe storage volume available on January 31, 1980, the proposed fill volume and the proposed compensation volume. Beyond the summary table, the engineering report should contain the actual calculations demonstrating compliance with the rules, with reference to any accompanying engineering drawings. Note that only one copy of the engineering report needs to be submitted with each application.

Design performance standards for individual permits are set forth in the Flood Hazard Area Control Act rules within N.J.A.C. 7:13-10 and 11. These subchapters itemize the specific requirements for the entire range of activities regulated by the rules. The engineering report needs to refer to each specific section of the rules relevant to the site and the proposed activity thereon. The contents of the report should be structured as a response to each of the design requirements for a given section of this subchapter. This may be accomplished as either an itemized, point by point response to each design standard when no calculations are required, or it should contain the specific information as outlined below.

Note that the signature and seal of professional engineer licensed in the State of New Jersey must be on the first page of the report, along with any necessary contact information.

Hydrology and Hydraulics

Hydrologic and hydraulic calculations are typically required when a flood hazard area verification is requested and when, under an individual permit, in-watercourse activities are proposed, such as bridges, culverts, dams, stream stabilization and restoration projects, and flood control projects.

The first step in demonstrating compliance with the relevant sections of the rules as they pertain to the above types of projects is the establishment of specific flow rates. (Note that this section of the manual only serves to offer guidance on how to present the information to the Department for review. Refer to Section 2.4 of this manual for specific information regarding how to compute flow rates or where to find information to compute flow rates.)

Regardless of the methodology used to determine the flow rates of interest, all supporting documentation or calculations used to determine the flow rates should be included in the engineering report. It is not acceptable to simply state what the flow rate is without an explanation of the source of this data.

If gauge information is used to develop the flow rates, then the location of the gauge relative to the project site should be discussed in the report. The reliability of the gauge should also be discussed and a transfer calculation should be submitted as appropriate. If a State or federal flood study is used to determine the flow rates, then these sources should be cited in the engineering report.

Alternatively, if the flow rates will be determined via an independent calculation, then the engineering report must contain all backup information and calculations that go into the derivation of the specific flow rate. For example, the following information would need to be submitted as part of the report: the size of the contributory drainage area to the most downstream point of interest on the subject site, a breakdown of the individual land use land cover/runoff coefficients within the contributory drainage area, a calculation of relevant times of concentration/rainfall intensities, and the resultant hydrographs. The Department reserves the right to request additional information as necessary to determine the validity of the computed flow rates. Note that the size of the contributory drainage area is most easily demonstrated via the submission of a USGS quadrangle map with the limits of the contributory drainage area outlined directly thereon.

For any hydraulic computation, whether it is a normal depth calculation, critical depth calculation, standard step calculation, hydraulic routing, etc., the engineering report should contain a list of all assumptions used to construct the hydraulic model. This includes, but is not limited to, a discussion with respect to the suitability of the selected hydraulic method, a reference calculation for starting water surface elevations and justification for the type of flow regime selected for the hydraulic model (subcritical, supercritical, or mixed flow), the roughness coefficients selected, and any areas of ineffective flow identified. All input data for the hydraulic model should be submitted as well, and it should be done in a legible format.

In addition to the input data, all output data computed by the model must be submitted as part of the engineering report. An explanation of any notes, warnings, or error messages returned by the model should be a part of the engineering report.

Engineering drawings will be required to supplement the hydrologic and hydraulic section of the engineering report. For hydraulic work, a cross section location plan must be submitted showing the location of the cross sections used in the model. These cross sections should be drawn looking in the downstream direction. The placement and number of cross sections needed to adequately model the watercourse is at the discretion of the design professional, but they should be selected to be representative of the watercourse throughout the area of study. All cross sections should be plotted on the engineering drawings and be signed and sealed by a professional engineer licensed in the State of New Jersey. The horizontal scale should not exceed 1 inch equals 20 feet. The vertical scale should not exceed 1 inch equals 5 feet. Each individual cross section should depict both the location of the floodway (if an encroachment run was performed) and the elevation of the flood of interest. For each given cross section, topography for the survey work should be measured at least at every slope change within the banks of the watercourse and at least at every 1-foot contour interval outside of the bank. For any hydraulic analysis, longitudinal stream profiles should be drafted that show the existing and proposed flood elevations for a given return period. Refer to Section 12.6 of this manual for further information concerning engineering drawings.

Take note that some projects will impact the ability of a watercourse to convey floodwaters. This may occur in a situation where an applicant proposes to replace a bridge or culvert with a larger, more hydraulically efficient structure. In cases like these, an additional hydraulic analysis should be performed beyond the standard step method. This analysis consists of a routing of the stream corridor to determine the upstream storage loss and its effect on both the downstream flow rate and flood elevation for a variety of return events. For these types of scenarios, it is important to submit a graphical representation of the existing and proposed flood hazard areas for each storm under consideration upstream of the project. This will help visualize the limits of the upstream volume loss for the routing analysis.

Net Fill

In many cases, a geometric computation of the change in flood storage volume on a given site should be submitted to demonstrate compliance with the net fill standard. In these cases, when the Average End Area Method is utilized, cross sections are required to demonstrate compliance with the rules. The number of cross sections, as well as their locations, are at the discretion of the design professional but should be placed in areas representative of the site at a frequency representative of the site. Each cross section should be shown on engineering drawings that are signed and sealed by a professional engineer licensed in the State of New Jersey. The horizontal scale of the cross sections should not exceed 1 inch equals 20 feet, and the vertical scale should not exceed 1 inch equals 5 feet. The drawings should also contain a cross section location plan as well as a base line from which all station and elevation information is presented within a given cross section. On each plotted cross section, a line should be drawn indicative of both the 10-year flood elevation and the flood hazard area design flood elevation. The floodway location should also be depicted on the cross section. Existing and proposed topography should be overlaid on each cross section, with a different weighted line representing each of the existing and proposed conditions.

Alternatively, when the Grid Method is used to demonstrate compliance with the rules, the size of the grid is at the discretion of the design professional. Each grid should be of a size representative of the area being modeled. The size should be noted. The existing and proposed elevations at each corner of each grid should be shown, as well as the average grid elevation.

The engineering report should contain a tabular computation of the proposed volumetric modifications on a given site. This computation should contain the existing and proposed flood fringe storage volumes for each cross section or grid, as well as the overall flood fringe storage volume for each of the 10-year and regulatory floods for both the existing and proposed conditions. This computation may be placed directly on the engineering drawings or separately within the engineering report.

Please refer to Section 3 of this manual for additional criteria concerning compliance with the net fill standard and to Section 12.6 of this manual for additional criteria concerning engineering drawings.

Stability Analysis

A stability analysis is required for any structure proposed within a floodway or for retaining walls that are four feet or greater in height that are located in either a floodway or flood fringe. The stability analysis must be bound and signed and sealed by a professional engineer licensed in the State of New Jersey. The analysis should include a descriptive summary of the calculation, explaining how the proposed design will resist uplift and overturning during a flood event equivalent to the regulatory flood, as well as a copy of the actual calculations.

Stormwater Management

A stormwater management report must be submitted for any project under the jurisdiction of the Flood Hazard Area Control Act rules that also qualifies as a major development under the Stormwater Management rules at N.J.A.C. 7:8-1.2. This report must demonstrate compliance with both the Flood Hazard Area Control Act rules at N.J.A.C. 7:13-11.2 and the Stormwater Management rules at N.J.A.C. 7:8. The report must address hydrology, low impact design, quantity, quality, recharge and BMP maintenance. The report must contain a narrative summarizing compliance with the specific standards of these rules as well as supporting calculations. It must contain properly completed versions of the Low Impact Development Checklist or the Non-Structural Point System Spreadsheet.

The stormwater management report should contain a summary of all assumptions made during the stormwater analysis. This includes any information used to determine existing and proposed condition flow rates, including a discussion of any features on site that would serve to naturally attenuate flow rates in the existing condition. Tables should be generated to summarize all input data used to devise existing condition hydrographs. Similarly, all input data should be submitted for the proposed condition hydrographs. This includes those hydrographs that will serve as input for basin routings. Elevation-volume-discharge tables should also be submitted based on the configuration of any proposed outlet control structures. Finally, a signed and sealed soils report must be submitted that details the location of the seasonal high groundwater table and the permeability of the soil. Please note that permeability rates calculated via a sieve analysis are not acceptable.

Engineering drawings must be drafted to supplement the stormwater management calculations, including existing and proposed condition drainage area maps. These maps should clearly show existing and proposed runoff flow paths. An additional engineering drawing should be drafted to visually depict all proposed non-structural design strategies employed in the site design. A drawing is also needed that shows dimensioned details for each stormwater BMP proposed for the site.

12.6 Engineering Drawings

In addition to the requirements for drawings listed above, the following is a discussion on the general requirements for all engineering drawings.

The applicant must submit six copies of the engineering drawings associated with any proposed project under a verification, general permit or individual permit. These drawings must be signed and sealed by a professional engineer licensed in the State of New Jersey. The drawings must be folded. Rolled drawings will not be accepted for review. Each drawing must contain a title block, drawing date, and any and all revision dates.

In general, the engineering drawings should contain the following information for all permit applications. Each of these items is discussed in further detail below.

- Environmental constraints map
- Overall site plan
- Overall grading, drainage, and utility plan
- Soil erosion and sediment control plan
- Landscaping plan
- Construction detail sheet

Environmental Constraints Map

This drawing should depict the existing land use land coverage of the site. It should also show all environmentally sensitive areas, including the location of the floodway and flood hazard area, the limit of the riparian zone, the presence of any freshwater wetlands and associated transition areas, any easements on the property, and any deed restricted or otherwise encumbered areas.

Overall Site, Grading, and Utility Plans

These drawings should show every aspect of the proposed project itself, as well as the anticipated limits of disturbance onsite to facilitate its construction. They should contain existing and proposed topographic information at a contour interval no greater than 2 feet in plan view. The entire scope of the proposed project should be shown on these drawings. The proposed features should be shown as overlays on existing features.

Areas within the riparian zone proposed for disturbance should be shaded on the engineering drawings. The drawings should also contain a notation stating the area of riparian zone vegetative disturbance proposed onsite in square feet for each individual activity in the riparian zone.

For larger projects, overall plans must also be submitted. In these cases, the overall plans may serve as an index sheet for the individual drawings that will provide the level of detail needed for clarity. Each of the individual sheets should contain match lines for accompanying sheets.

When referencing a published or approved flood hazard area elevation, the drawings must provide a vertical datum that references (or includes a conversion to) NGVD 1929.

Soil Erosion and Sediment Control Plan

This plan is required to show all soil erosion measures to be implemented on the site to be developed and the limit of disturbance, at a minimum. This includes, but is not limited to, the location and extent of any silt fences or turbidity barriers.

Landscaping plan

This plan should show all proposed landscaping on the site to be developed. It should specify the species and density of vegetation to be planted as part of the development project. It should also clearly depict any proposed areas of compensation for riparian zone vegetation that will be provided to meet the 2:1 requirements at N.J.A.C. 7:13-10.2(t) and (u).

Construction detail plan:

This plan must show all construction details relevant to the proposed project that can not be otherwise depicted on other engineering drawings. For example, the construction detail plan should contain basin outlet structures, depicting both the size and elevation of any associated orifice or weir outflows. The detail plans should also depict any headwalls, riprap aprons, and utility crossings with associated encasement details.

12.7 Environmental Report

The material required for an environmental report falls into three basic categories: a written narrative that describes the proposed design and the construction techniques that will be employed, as discussed in N.J.A.C. 7:13-15.5(a)1; maps providing an environmental inventory of the site, as discussed in N.J.A.C. 7:13-15.5(a)2; and an analysis that focuses on any potential adverse environmental impacts the project may cause and describes how these potential impacts will be minimized, as discussed in N.J.A.C. 7:13-15.5(a)3.

An environmental report required under this chapter shall include a narrative that describes the proposed design and the construction techniques that will be used. Maps such as freshwater wetlands maps and USDA soil surveys along with the above mentioned environmental constraints map should be submitted.

As part of the environmental report, an analysis should be included to address any projected adverse impacts to environmental resources. This analysis should include a detailed description of how projected adverse impacts are proposed to be minimized. This analysis should also discuss all temporary and permanent adverse impacts of each proposed activity, and whether the impacts will occur onsite or offsite in channels or in riparian zones, whether fishery resources or threatened or endangered species will be impacted, whether acid producing soils will be exposed, and whether the proposed construction will cause the potential for erosion and turbidity. If it is determined that a proposed project is likely to cause an adverse impact to any of these resources, the environmental report shall include the following material:

1. A justification for the project, including an explanation of why the proposed activity is the most appropriate for the site and how the proposed design minimizes environmental damage;
2. An analysis of alternatives to the proposed activity, including the no-build alternative;
3. A description of all measures to be taken to reduce temporary and permanent detrimental impacts to each resource listed above, whether onsite or offsite; and
4. A plan to mitigate the effects of all unavoidable adverse impacts.

N.J.A.C. 7:13-15.5(c) addresses requirements for a survey for threatened or endangered species, including requirements governing the timing and techniques for such a survey, and the necessary education and experience for a person performing such a survey.

Appendix 1

Documents Related to Fishery Resources

This appendix contains the following three documents, described at N.J.A.C. 7:13-10.5(b), which have been prepared by the Department's Division of Fish and Wildlife:

1. "Classification of New Jersey Waters as Related to Their Suitability for Trout"
2. "List of Waters Stocked with Trout by the New Jersey Division of Fish and Wildlife"
3. "Locations of Anadromous American Shad and River Herring During Their Spawning Period in New Jersey's Freshwaters Including Known Migratory Impediments and Fish Ladders"

These documents are periodically updated by the Department. If you have any questions regarding the information contained in these documents, please consult the Department's Division of Fish and Wildlife, which may be contacted as follows:

N.J. Division of Fish and Wildlife
P.O. Box 400
Trenton, NJ 08625-0400

General Information: (609) 292-2965
Website: www.nj.gov/dep/fgw/

New Jersey Division of Fish and Wildlife

Classification of New Jersey Waters as Related to Their Suitability for Trout[1]

General Explanation

This classification was developed by the Bureau of Freshwater Fisheries under Project F-20-R, which was supported in part by Dingell-Johnson Federal-Aid-to-Fisheries funds administered by the U.S. Fish and Wildlife Service (USFWS). This report is periodically revised by the Bureau under Project F-48-R, "Investigations and Management of New Jersey's Freshwater Fisheries Resources", which is supported in part by Wallup-Breaux funds administered by the USFWS. Users should check with the Bureau to ensure that they have the most up-to-date version.

The official surface water classifications for the waters of the State are contained in the Surface Water Quality Standards (SWQS) adopted by the Department of Environmental Protection (N.J.A.C. 7:9B-1). A copy of this document may be obtained online at http://www.state.nj.us/dep/wmm/sgwqt/swqsdocs.html. <u>Official verification of a surface water classification can be obtained from the Department's Bureau of Water Quality Standards and Assessment, P.O. 409, Trenton, NJ 08625.</u>

This report is divided into three parts. Part One of this report corresponds to the FW2 Trout Production (FW2-TP), FW2 Trout Maintenance (FW2-TM), and FW2 Non Trout (FW2-NT) classifications promulgated at N.J.A.C. 7:9B-1.15, with the following exceptions:

1. Some of the waters listed in Part One are classified in the SWQS as FW1 waters, Category 1 (C1) waters, Pinelands (PL) waters, saline waters of estuaries (SE), or as "Zones" of the mainstem Delaware River.

2. Some of the waters listed by name in the SWQS as FW2-TM or FW2-NT are not listed by name in Part One. In many cases where Part One lists an entire drainage as nontrout, individual waters in that drainage are listed by name in the SWQS. Even where Part One does not list an entire drainage as nontrout, there are some cases where the SWQS list FW2-TM or FW2-NT tributary waters that are not listed by name in Part One. However, the classifications of these waters in the SWQS are in Part One, through the use of the instructions presented below for the classification of waters that are not listed in Part One, are consistent.

To determine the classification of waters that are not listed in Part One, follow these instructions:

1. Unnamed or unlisted streams that flow into trout production, trout maintenance, or nontrout streams take the classification of the streams they enter.

[1] Pursuant to N.J.A.C. 7:9B Surface Water Quality Standards, adopted June 20, 2005

2. All lakes, ponds, and reservoirs that are five or more acres in surface area, and that are not specifically listed as trout production or trout maintenance waters, are classified as nontrout. This includes impoundments on the main stems of trout maintenance or trout production streams (e.g., Saxton Lake on the Musconetcong River and Lake Solitude on the South Branch of the Raritan River).

3. All lakes, ponds, and reservoirs that are less than five acres in surface area, and that are upstream of and contiguous with trout production or trout maintenance streams, are classified as trout maintenance.

4. Unnamed or unlisted streams that enter lakes, ponds, and reservoirs take the classification of either the listed tributary stream flowing into the lake with the highest classification or the listed tributary stream leaving the lake with the highest classification, whichever has the highest classification, or if there are no listed tributary or outlet streams to the lake, the first listed stream downstream of the lake.

These instructions are similar to instructions given at N.J.A.C. 7:9B-1.15(b) in the SWQS. Reclassification of streams, tributaries, lakes, ponds or reservoirs may occur if sufficient evidence warrants it.

A symbol preceding a water listed in Part One indicates the following:

* Nontrout water is located upstream of and flows into a trout maintenance water (in some cases, via another nontrout water).

** Trout maintenance or nontrout water is located upstream of and flows into a trout production water (in some cases, via another trout maintenance or nontrout water).

\+ Listing for all or part of this drainage would be changed if a potential change listed in Part Four is adopted.

Part Two ("List of New Jersey Trout Production Waters With Resident Reproducing Trout Species Identified") lists the specific trout species that have been identified as reproducing in each trout production stream listed in Part One and Part Three.

Part Three ("Potential Reclassifications of New Jersey Waters as Related to Their Suitability for Trout") lists changes to the classifications recommended by the Bureau of Freshwater Fisheries. These changes may become official when the SWQS are next officially revised.

PART ONE

Classification of New Jersey Waters as Related to Their Suitability for Trout

(For official surface water classifications consult N.J.A.C. 7:9B-1.15)

Alloway Creek Drainage

Non-trout Waters	Entire drainage

Assiscunk Creek Drainage

Non-trout Waters	Entire drainage

Assunpink Creek Drainage

Non-trout Waters	Entire drainage

Atlantic Ocean (Atlantic Co.) Drainage

Non-trout Waters	Entire drainage

Atlantic Ocean (Cape May Co.) Drainage

Non-trout Waters	Entire drainage

Arthur Kill (Middlesex Co.) Drainage

Non-trout Waters	Entire drainage

Arthur Kill (Union Co.) Drainage

Non-trout Waters	Entire drainage

Barnegat Bay (Ocean Co.) Drainage

Non-trout Waters	Entire drainage

Big Timber Creek Drainage

Trout Production Waters	
Masons Run (Pine Hill)	Source to Little Mill Road
Non-trout Waters	All other drainage

Blacks Creek Drainage

Non-trout Waters — Entire drainage

Cedar Creek Drainage

Non-trout Waters — Entire drainage

Cohansey River Drainage

Non-trout Waters — Entire drainage

Cooper River Drainage

Non-trout Waters — Entire drainage

Crosswicks Creek Drainage

Non-trout Waters — Entire drainage

Delaware Bay (Cape May Co.) Drainage

Non-trout Waters — Entire drainage

Delaware Bay (Cumberland Co.) Drainage

Non-trout Waters — Entire drainage

Delaware and Raritan Canal (Mainstem and Feeder)

Non-trout Waters — Entire length

Delaware River (Mainstem)

Non-trout Waters — Entire length within New Jersey

Delaware River (Burlington Co.) Drainage

Non-trout Waters — Entire drainage

Delaware River (Camden Co.) Drainage

Non-trout Waters — Entire drainage

Delaware River (Gloucester Co.) Drainage

Non-trout Waters — Entire drainage

Delaware River (Hunterdon Co.) Drainage

Trout Production Waters

Delaware River (trib.)(Holland)	Entire length
Hakihokake Creek (Milford)	Entire length (including headwaters known as Little York Creek (Brook))
Hakihokake Creek (trib.)(Wydner)	Entire length (source to confluence with Hakihokake Creek west of York Road
Little York (Brook) Creek (Little York) – See Hakihokake Creek	
Spring Mills Brook (Milford)	Entire length
Warford Creek (Barbertown)	Entire length

Trout Maintenance Waters

Alexauken Creek (Lambertville)	Entire length
Harihokake Creek (Frenchtown)	Rt. 519 bridge to Delaware River, including all tributaries
Lockatong Creek (Raven Rock)	Idell bridge to Delaware River
Plum Brook (Sergeantsville)	Entire length
Wichecheoke Creek (Stockton)	Confluence with Plum Brook to Delaware River

Non Trout Waters

* Harihokake Creek (Alexandria)	Source to Rt. 519 bridge, including all tributaries
* Lockatong Creek (Kingwood)	Source to Idell bridge
Nishisakawick Creek (Frenchtown)	Entire length
Swan Creek (Lambertville)	Entire length
* Wickecheoke Creek (Locktown)	Source to confluence with Plum Brook

Delaware River (Mercer Co.) Drainage

Trout Maintenance Waters

Fiddlers Creek (Titusville)	Entire length
Moore Creek (Hopewell)	Entire length

Non-trout Waters

Jacobs Creek (Hopewell)	Entire length

Delaware River (Sussex Co.) Drainage

Trout Production Waters

Clove (Mill) Brook (Montague)	Lake Marcia outlet to State line
Mill Brook (Montague) – see Clove Brook	
Sandyston Creek (Sandyston)	Entire length
Shimers Brook (Millville)	Entire length

	White Brook (Montague)	Entire length

Trout Maintenance Waters

**	Lake Marcia (High Point State Park)	-

Delaware River (Warren Co.) Drainage

Trout Production Waters

Buckhorn Creek (Hutchinson)	Entire length
Delawanna Creek (Delaware)	Delaware Lake dam downstream to Delaware River
Delaware River (trib.)(Knowlton)	Entire length
Dunnfield Creek (Del. Water Gap)	Entire length
Knowlton Brook (Knowlton)	Entire length
Lommasons Glen Brook (Lommasons Glen)	Entire length
Lopatcong Creek (Phillipsburg)	Source to a point 560 feet (straightline distance) upstream of the Penn Central railroad track, including all tributaries
Lopatcong Creek (trib.)(Uniontown)	Entire length
Pophandusing Creek (Hazen)	Source downstream to Rt. 519 bridge
Stony Brook (Knowlton)	Entire length
Van Campens Brook (Millbrook)	Entire length

Trout Maintenance Waters

**	Delawanna Creek (Delaware)	Source downstream to, but not including, Delaware Lake
	Lopatcong Creek (Phillipsburg)	From a point 560 feet (straightline distance) upstream of Penn Central railroad track downstream to the confluence with the Delaware River
	Pophandusing Creek (Belvidere)	Rt. 519 bridge downstream to confluence with the Delaware River

Elizabeth River Drainage

Non-trout Waters	Entire drainage

Flat Brook Drainage

Trout Production Waters

Beerskill (Shaytown)	Entire length
Big Flat Brook (Sandyston)	Confluence with Parker Brook downstream to confluence with Flat Brook
Big Flat Brook (trib.)(Tuttles Corner)	Outlet stream from Lake Ashroe to confluence

		with Big Flat Brook
	Flat Brook (Flatbrook-Roy)	Confluence of Big Flat Brook and Little Flat Brook downstream to the boundary of Flatbrook-Roy WMA
	Forked Brook (Stokes S.F.)	Entire length
	Little Flat Brook (Layton)	Entire length
	Parker Brook (Montague)	Entire length
	Shawanni Creek (Stokes S.F.)	Entire length
	Stony Brook (Stokes S.F.)	Entire length
	Tillman Brook (Walpack)	Entire length
	Tuttles Corner Brook (Tuttles Corner)	Entire length

<u>Trout Maintenance Waters</u>

	Flat Brook (Walpack)	Flatbrook-Roy WMA boundary downstream to Delaware River
**	Stony Lake (Stokes S.F.)	-

<u>Non-trout Waters</u>

**	Big Flat Brook (Montague)	Sawmill Pond to confluence with Parker Brook

Forked River Drainage

<u>Non-trout Waters</u> Entire drainage

Great Egg Harbor River Drainage

<u>Non-trout Waters</u> Entire drainage

Hackensack River Drainage

<u>Trout Production Waters</u>

Cresskill Brook (Alpine)	Source to Duck Pond Road bridge, Demarest

<u>Non-trout Waters</u>

Cresskill Brook (Demarest)	Duck Pond Road bridge to Tenakill Brook
Tenakill Brook (Demarest)	Entire length, including all tributaries except Cresskill Brook

Hudson River Drainage

<u>Non-trout Waters</u> Entire drainage

Little Egg Harbor (Manahawkin Bay) Drainage

<u>Non-trout Waters</u> Entire drainage

Manasquan River Drainage

Trout Maintenance Waters

Manasquan River (Farmingdale)	Rt. 9 bridge to surf waters
Mingamahone Brook (Farmingdale)	Entire length

Non-trout Waters

*	Bear Swamp Brook (Squankum)	Entire length
	Deep Creek (Herbertsville)	Entire length
*	Long Swamp Brook (Squankum)	Entire length
*	Manasquan River (Freehold)	Source to Rt. 9 bridge
*	Manasquan River (trib.)(Adelphia)	Entire length
*	Marsh Bog Brook (Farmingdale)	Entire length
*	Mill Run (Allaire S.P.)	Entire length
*	Mingamahone Brook, E/Br. (Farmingdale)	Entire length
*	Squankum Brook (Squankum)	Entire length
*	Timber Swamp Brook (Oak Glen)	Entire length

Mantua Creek Drainage

Non-trout Waters	Entire drainage

Maurice River Drainage

Non-trout Waters	Entire drainage

Metedeconk River Drainage

Trout Maintenance Waters

Clear Stream (Jackson)	Entire length
Metedeconk River, N/Br. (Lakewood)	Aldrich Road to Lanes Mills
Muddy Ford Brook (Larrabee's Crossing)	Entire length
Titmouse Brook (Howell)	Entire length

Non-trout Waters

	Cedar Bridge Branch (Lakewood)	Entire length
*	Dicks Brook (Larrabee's Crossing)	Entire length
*	Hay Stack Brook (Howell)	Entire length
*	Metedeconk River, N/Br. (Freehold)	Source to Aldrich Road, including all tributaries
	Metedeconk River, N/Br. (Brick)	Lanes Mills to confluence with S/Br. Metedeconk River
	Metedeconk River, S/Br. (Lakewood)	Entire length
	Metedeconk River (Brick)	Confluence of north and south branches to Barnegat Bay

Morses Creek Drainage

Non-trout Waters	Entire drainage

Mullica River Drainage

Non-trout Waters	Entire drainage

Musconetcong River Drainage

Trout Production Waters

Beatty's Brook (Penwell)	Entire length
Bowers Brook (Hackettstown)	Source downstream to Rt. 517
Hances Brook (Rockport)	Entire length
Kurtenbach's Brook (Waterloo)	Entire length
Mine Brook (Mt. Olive)	Lower Mine Brook Reservoir outlet downstream to Drakestown Road Bridge
Mine Brook (trib.)(Drakestown)	Source downstream to, but not including, Burd Reservoir
Mine Brook (trib.)(Washington)	Entire length of tributary which joins Mine Brook approximately 280 yards upstream of the confluence with the Musconetcong River
Musconetcong River (trib.)(Anderson)	Entire length
Musconetcong River (trib.)(Changewater)	Entire length
Musconetcong River (trib.)(Franklin)	Entire length
Musconetcong River (trib.)(Lebanon)	Entire length
Musconetcong River (trib.)(Port Murray)	Entire length
Musconetcong River (trib.)(S. of Point Mtn.)	Entire length
Musconetcong River (trib.)(S. of Schooley's Mtn. Brook)	Entire length
Musconetcong River (trib.)(Waterloo)	Tributary west of Kurtenbach's Brook from source downstream to Waterloo Valley Road bridge
Schooley's Mtn. Brook (Schooley's Mtn.)	Entire length
Stephensburg Creek (Stephensburg)	Entire length
Turkey Hill Brook (Bethlehem)	Entire length
West Portal (Brook) Creek (West Portal)	Entire length

Trout Maintenance Waters

	Cranberry Lake (Byram)	-
	Hatchery Brook (Hackettstown)	Entire length
	Lake Hopatcong (Hopatcong)	-
	Lubbers Run (Byram)	Entire length
**	Mine Brook (Mt. Olive)	Source to, but not including, Upper Mine Brook Reservoir, downstream to Lower Mine Brook

		Reservoir outlet
	Mine Brook (Hackettstown)	Drakestown Road bridge downstream to confluence with the Musconetcong River
	Mine Brook (trib.)(Drakestown)	Burd Reservoir downstream to confluence with Mine Brook
	Musconetcong River (Hackettstown)	Lake Hopatcong dam to Delaware River
	Musconetcong River (trib.)(Deer Park Pond)	Deer Park Pond outlet stream downstream to Musconetcong River
	Musconetcong River (trib.)(N. of Hackettstown)	Entire length
	Trout Brook (Hackettstown)	Entire length
	Weldon Brook (Jefferson Twp.)	From source to, but not including, Lake Shawnee
	Wills Brook (Mt. Olive)	Entire length

<u>Non-trout Waters</u>

*	Beaver Brook (Jefferson)	Source to, but not including, Lake Shawnee
*	Cranberry Lake Outlet Stream (Byram)	Entire length
*	Musconetcong River (trib.)(Deer Park Pond)	Source downstream to outlet of Deer Park Pond

<u>Navesink River Drainage</u>

<u>Trout Maintenance Waters</u>

Hockhocksen Brook (Colts Neck)	Entire length
Hop Brook – see Ramanessin Brook	
Pine Brook (Cooks Mill)	Entire length
Ramanessin (Hop) Brook (Holmdel)	Entire length

<u>Non-trout Waters</u>

Big Brook (Vanderberg)	Entire length
Mine Brook (Colts Neck)	Entire length
Willow Brook (Holmdel)	Entire length
Yellow Brook (Colts Neck)	Entire length

<u>Newark Bay (Essex Co.) Drainage</u>

<u>Non-trout Waters</u> Entire drainage

<u>Newark Bay (Hudson Co.) Drainage</u>

<u>Non-trout Waters</u> Entire drainage

Newark Bay (Union Co.) Drainage

Non-trout Waters	Entire drainage

Oldmans Creek Drainage

Non-trout Waters	Entire drainage

Oyster Creek Drainage

Non-trout Waters	Entire drainage

Passaic River Drainage

Trout Production Waters

Apshawa Brook (Macopin)	Entire length
Bear Swamp Brook (Mahwah)	Entire length
Beaver Brook (Meriden)	From Splitrock Reservoir Dam downstream to Meriden Road bridge
Beaver Brook (tribs.)(Meriden)	Entire length of two tributaries located approximately three quarters of a mile southwest of Meriden
Blue Mine Brook (Wanaque)	Headwaters downstream to lower Snake Den Road bridge
Burnt Meadow Brook (Stonetown)	Entire length
Clinton Brook (W. Milford)	Clinton Reservoir dam to Pequannock River
Clove Brook – see Stag Brook	
Cooley Brook (W. Milford)	Entire length
Crooked Brook (trib.)(E. of Sheep Hill)	Entire length
Den Brook (trib.)(Randolph)	Entire length (Tributary west of Shongum Lake)
Green Brook (West Milford)	Entire length
Green Pond Brook (Picatinny Arsenal)	Green Pond outlet to, but not including, Picatinny Lake
Harmony Brook (Brookside)	Entire length
Havemeyer Brook (Mahwah)	Entire length
Hewitt Brook (West Milford)	Entire length
Hibernia Brook (Marcella)	Source to first Green Pond Road bridge downstream of Lake Emma
Hibernia Brook (trib.)(Lake Ames)	Source to, but not including, Lake Ames
High Mountain Brook (Ringwood)	Source to, but not including, Skyline Lake
Indian Grove Brook (Bernardsville)	Entire length
Jackson Brook (Mine Hill)	Source to the boundary of Hurd Park, Dover
Jennings Creek (W. Milford)	State line to Wanaque River
Kanouse Brook (Newfoundland)	Entire length
Lake Stockholm Brook (Stockholm)	Entire length
Little Pond Brook (Oakland)	Entire length

	Macopin River (Newfoundland)	Echo Lake dam downstream to Pequannock River
	Meadow Brook (Wanaque)	E. Belmont Avenue downstream to Wanaque River
	Mill Brook (Randolph)	Source to Rt. 10 bridge
	Mill Brook (trib.)(N. of Union Hill)	Entire length
	Mossmans Brook (W. Milford)	Source to confluence with Clinton Reservoir
	Passaic River (Mendham)	Source downstream to, but not including, Osborn Pond
	Pequannock River (Vernon)	Source to confluence with Pacock Brook
	Pequannock River (Hardyston)	From Pacock Brook to, but not including, Oak Ridge Reservoir
	Pequannock River (Newfoundland)	Outlet of Oak Ridge Reservoir downstream to, but not including, Charlotteburg Reservoir
	Pequannock River (Charlotteburg)	Outlet of Charlotteburg Reservoir to, but not including, Macopin Reservoir
	Pequannock River (Kinnelon)	Macopin Reservoir outlet to Hamburg Turnpike bridge in Pompton Lakes Borough
	Pequannock River (trib.)(Copperas Mtn.)	Entire length
+	Pequannock River (trib.)(Maple Lake)	Entire length
	Pequannock River (trib.)(Smoke Rise)	Entire length
	Preakness (Singac) Brook (Wayne)	Source to, but not including, Barbour Pond
	Primrose Brook (Harding)	Source to Lees Hill Road bridge
	Ramapo River (trib.)(Oakland)	Entire length
	Russia Brook (trib.)(S. of St. Paul)	Entire length
+	Saddle River (Upper Saddle River)	State line to Bergen Co. Rt. 2 bridge
	Singac Brook – see Preakness Brook	
	Stag (Clove) Brook (Mahwah)	Entire length
	Wallace Brook (Randolph)	Source downstream to, but not including Hedden Park Lake
	Wanaque River (trib)(Hewitt)	Entire length of tributary south of Jennings Creek
	West Brook (W. Milford)	Entire length
	Whippany River (Brookside)	Source to Whitehead Road bridge
	Whippany River (trib.)(Brookside)	Entire length
	Whippany River (trib.)(Gillespie Hill)	Entire length

<u>Trout Maintenance Waters</u>

+	Beech Brook (West Milford)	From State line downstream to Monksville Reservoir
	Blue Mine Brook (Wanaque)	Lower Snake Den Road bridge to Wanaque Reservoir
	Boonton Reservoir – see Jersey City Res.	-
**	Canistear Reservoir (Vernon)	-
**	Charlotteburg Reservoir (Charlotteburg)	-
**	Clinton Reservoir (West Milford)	-
**	Green Pond (Rockaway)	-
	Greenwood Lake (W. Milford)	-

	Hibernia Brook (Hibernia)	First Green Pond Road bridge to confluence with Beaver Brook
	Jersey City Reservoir (Boonton)	-
	Mill Brook (Randolph)	Rt. 10 bridge downstream to Rockaway River, including the easterly tributary
	Monksville Reservoir (Long Pond Iron Works State Park)	-
**	Oak Ridge Reservoir (Oak Ridge)	-
	Ohio Brook (Morris Twp.)	Source downstream to Morristown town line
	Pequannock River (Riverdale)	Hamburg Turnpike bridge in Pompton Lakes Borough to confluence with Wanaque River
**	Pequannock River (trib.)(Lake Kampfe)	Source downstream to, but not including, Lake Kampfe
	Ringwood (Brook) Creek (Ringwood)	Entire length
	Rockaway River (Dover)	Washington Pond outlet downstream to Rt. 46 bridge
	Russia Brook (Milton)	Lake Hartung dam to, but not including, Lake Swannanoa
	Saddle River (Saddle River)	Bergen Co. Rt. 2 bridge to Allendale Rd. bridge
	Scarlet Oak Pond (Mahwah)	-
	Sheppard Lake (Ringwood)	-
**	Splitrock Reservoir (Rockaway)	-
	Wanaque Reservoir (Wanaque)	-
	Wanaque River (Wanaque)	Greenwood Lake outlet to the Monksville Reservoir dam at Stonetown Road
	Wanaque River (Pompton Lakes)	Wanaque Avenue bridge downstream to Pequannock River
	Whippany River (trib.)(E. of Brookside trib.)	Entire length
	Whippany River (trib.)(E. of Washington Valley)	Entire length

<u>Non-trout Waters</u>

*	Beaver Brook (Denville)	Meriden Road bridge to Rockaway River
*	Belcher Creek (West Milford)	Entire length
	Black Brook (Meyersville)	Entire length
**	Burnt Meadow Brook (Green Pond)	Source downstream to confluence with Green Pond Brook
	Canoe Brook (Chatham)	Entire length
**	Cherry Ridge Brook (Vernon)	Entire length
	Corys Brook (Warren)	Entire length
*	Cupsaw Brook (Skylands)	Entire length (Source to Wanaque Reservoir)
	Dead River (Liberty Corners)	Entire length
*	Den Brook (Randolph)	Entire length
	Fox Brook (Mahwah)	Entire length
	Goffle Brook (Hawthorne)	Entire length

	Grannis Brook (Morris Plains)	Entire length
	Great Brook (Chatham)	Entire length
*	Green Pond Brook (Wharton)	Outlet of Picatinny Lake to the confluence with the Rockaway River
	Harrisons Brook (Bernards)	Entire length
	Hohokus Brook (Hohokus)	Entire length
*	Jackson Brook (Dover)	Hurd Park to Rockaway River
	Kikeout Brook – see Stone House Brook	
	Loantaka Brook (Green Village)	Entire length
**	Macopin River (Newfoundland)	Source downstream to Echo Lake dam
	Meadow Brook (Wanaque)	Skyline Lake downstream to E. Belmont Avenue
	Mt. Tabor Brook (Morris Plains)	Entire length
**	Pacock Brook (Stockholm)	Source downstream to Pequannock River, except Canistear Reservoir
	Passaic River (Paterson)	Outlet of Osborn Pond to Newark Bay
+	Peckman River (Verona)	Entire length
	Pequannock River (Pompton Plains)	Confluence with Wanaque River downstream to confluence with Pompton River
**	Pequannock River (trib.)(Lake Kampfe)	Lake Kampfe to Pequannock River
	Pompton Lake (Pompton Lakes)	-
	Pompton River (Wayne)	Entire length
	Pond Brook (Oakland)	Entire length
	Posts Brook (Bloomingdale)	Entire length
	Preakness (Singnac) Brook (Barbour Pond)	Pond to Passaic River
	Primrose Brook (Harding)	Lees Hill Road bridge to Great Brook
	Rahway River (Rahway)	Entire length
	Ramapo River (Mahwah)	State line to Pompton River
*	Rockaway River (Wharton)	Source to Washington Pond outlet
	Rockaway River (Boonton)	Rt. 46 bridge to Passaic River, excluding Jersey City Reservoir
*	Russia Brook (Sparta)	Source to Lake Hartung dam
	Saddle River (Lodi)	Allendale Rd. bridge downstream to Passaic River
	Sawmill Creek (Pompton Plains)	Entire length
	Slough Brook (Livingston)	Entire length
	Spring Garden Brook (Florham)	Entire length
	Stephens Brook (Roxbury)	Entire length
+**	Stone House Brook (Kinnelon)	Entire length (a.k.a. Kikeout Brook)
*	Stony Brook (Boonton)	Entire length
**	Timber Brook (Kitchell)	Entire length
	Troy Brook (Troy Hills)	Entire length
+	Wanaque River (Pompton Lakes)	Wanaque Reservoir dam to Wanaque Avenue bridge
	Whippany River (Morristown)	Whitehead Rd. bridge to Rockaway River
	Whippany River (trib.)(Shongum Mtn.)	Entire length

Paulins Kill Drainage

Trout Production Waters

	Paulins Kill, E/Br. (Lafayette)	Limecrest quarry to confluence with W/Br. Paulins Kill
	Paulins Kill (trib.)(Emmons Sta.)	Entire length
	Paulins Kill (trib.)(Stillwater Sta.)	Entire length
	Roy Spring Brook – see Paulins Kill (trib.)(Stillwater Sta.)	
	Trout Brook (Middleville)	Source to confluence with Pond Brook
	Yards Creek (Blairstown)	Entire length

Trout Maintenance Waters

	Alms House Brook (Hampton)	Source downstream to, but not including, County Farm Pond
	Blair Creek (Hardwick Center)	Bass Lake outlet to Paulins Kill
	Culver's Creek (Frankford)	Entire length
	Culver's Lake (Frankford)	-
	Jacksonburg Creek (Blairstown)	Entire length
	Neldon Brook - see Swartswood Creek	
	Paulina Creek (Paulina)	Entire length
	Paulins Kill (Blairstown)	Confluence of E/Br. and W/Br. to Rt. 15 bridge (bench mark 507)
+	Paulins Kill (Paulins Kill Lake)	Paulins Kill Lake dam to Delaware River
	Paulins Kill (trib.)(Blairstown)	Entire length of tributary east of Walnut Valley
	Paulins Kill (trib.)(Stillwater)	Entire length
**	Sparta Junction Brook (Sparta Junction)	Entire length
	Swartswood Creek (Swartswood)	Entire length (a.k.a. Neldon Brook)
	Swartswood Lake (Stillwater)	-
	White Lake (Hardwick)	-

Non-trout Waters

*	Alms House Brook (Frankford)	County Farm Pond to Paulins Kill
*	Blair Creek (Hardwick)	Source to Bass Lake
*	Clearview Creek (Hampton)	Source to Alms House Brook
*	Dry Brook (Branchville)	Entire length
*	Little Swartswood Lake (Swartswood)	-
*	Paulins Kill (Hampton)	Rt. 15 bridge to Paulins Kill Lake dam
**	Paulins Kill, E/Br. (Andover)	Source to Limecrest quarry
**	Paulins Kill, E/Br. (trib.)(Sussex Mills)	Entire length
*	Paulins Kill, W/Br. (Newton)	Entire length
*	Pond Brook (Middleville)	Swartswood Lake outlet to Trout Brook
*	Trout Brook (Middleville)	Confluence with Pond Brook to Paulins Kill

Pennsauken Creek Drainage

	<u>Non-trout Waters</u>	Entire drainage

<u>Pequest River Drainage</u>

<u>Trout Production Waters</u>

	Barkers Mill Brook (Independence)	Entire length
	Bear Brook (Johnsonburg)	Entire length
	Furnace (Oxford) Brook (Oxford)	Source to railroad bridge at Oxford
	Independence Creek (Alphano)	Source to Alphano Road
	Pequest River (trib.)(Petersburg)	Headwaters and tributaries downstream to Ryan Road bridge
	Trout Brook (Tranquility)	Entire length
	Tunnel Brook (Oxford Mountain.)	Entire length, including all tributaries

<u>Trout Maintenance Waters</u>

	Andover Junction Brook (Andover)	Entire length
	Bear Creek (Johnsonburg)	Entire length
	Brookaloo Swamp (Hope)	Entire length
**	Furnace Lake (Oxford)	-
	Gardners Lake (Andover)	-
	Honey Run (Hope)	Entire length
	Lake Aeroflex – see New Wawayanda Lake	
	Lake Illif (Andover)	-
	Mountain Lake (Liberty)	-
	Mountain Lake Creek (Brook) (Liberty)	Source to Mountain Lake
	Lake Aeroflex – see New Wawayanda Lake	
	New Wawayanda Lake (Andover)	-
	Pequest River (Tranquility)	Source to Tranquility bridge
	Pequest River (Townsbury)	The upstream most boundary of Pequest WMA to Delaware River
	Pequest River (trib.)(Janes Chapel)	Entire length including headwaters and tributaries
	Silver Lake (Hope)	-
	Tar Hill Brook (Lake Lenape)	Source to, but not including, Lake Lenape
	Trout Brook (Hope)	Entire length

<u>Non-trout Waters</u>

**	Allamuchy Creek (Allamuchy)	Entire length
*	Beaver Brook (Hope)	Entire length
*	Furnace Brook (Oxford)	Railroad bridge to Pequest River
*	Independence Creek (Alphano)	Alphano Road to Pequest River
*	Kymer Brook (Andover)	Entire length
*	Mountain Lake Brook (White)	Mountain Lake dam to Pequest River
*	Muddy Brook (Hope)	Entire length
*	Pequest River (Vienna)	Tranquility bridge to the upstream most boundary of the Pequest WMA

*	Tar Hill Brook (Lake Lenape)	Lake Lenape to Andover Junction Brook
*	Trout Brook (Allamuchy)	Entire length

Pochuck Creek Drainage

Trout Production Waters

Black Creek (trib.)(McAfee)	Entire length
Livingston Ponds Brook (Wawayanda S.P.)	Source downstream to State line
Spring Brook (Maple Grange)	Entire length

Trout Maintenance Waters

Black Creek (McAfee)	Source to Rt. 94 bridge
Glenwood Brook (Glenwood)	Outlet of Glenwood Lake to State line
Lounsberry Hollow Brook (Vernon Valley)	Outlet of Glenwood Lake to Pochuck Creek
Town Brook (Vernon)	Entire length
Wawayanda Creek (Vernon)	State line to Pochuck Creek
Wawayanda Lake (Wawayanda)	-

Non-trout Waters

	Black Creek (Vernon)	Rt. 94 bridge to Pochuck Creek
	Black Creek (trib.)(Vernon Valley)	Entire length
*	Longhouse Brook (Upper Greenwood Lake)	Source to State line
	Pochuck Creek (Vernon)	Source to State line
*	Sawmill Pond Brook (West Milford)	Entire length
*	Wawayanda Creek (trib.)(Wawayanda)	Source to State line

Pohatcong Creek Drainage

Trout Production Waters

Brass Castle Creek (Brass Castle)	Entire length
Halfway House Brook (Franklin)	Entire length
Merrill Creek (Harmony)	Entire length, but not including Merrill Creek Reservoir
Mill Brook (Broadway)	Entire length
Pohatcong Creek (Mansfield)	Source to Karrsville bridge, including all tributaries
Pohatcong Creek (Springtown)	Rt. 519 bridge to Delaware River
Pohatcong Creek (trib.)(Greenwich)	Entire length
Pohatcong Creek (trib.)(New Village)	Entire length
Pohatcong Creek (trib.)(Willow Grove)	Entire length

Trout Maintenance Waters

**	Merrill Creek Reservoir (Harmony)	-
**	Pohatcong Creek (Pohatcong)	Karrsville bridge to Rt. 519 bridge

Shabbecong Creek (Washington)	Entire length

Raccoon Creek Drainage

Non-trout Waters	Entire drainage

Rahway River Drainage

Non-trout Waters	Entire drainage

Rancocas Creek Drainage

Non-trout Waters	Entire drainage

Raritan Bay (Middlesex Co.) Drainage

Non-trout Waters	Entire drainage

Raritan Bay (Monmouth Co.) Drainage

Non-trout Waters	Entire drainage

Raritan River Drainage

Trout Production Waters

Beaver Brook (Cokesbury)	Source to Reformatory Road bridge
Beaver Brook (Annandale)	Beaver Avenue bridge downstream to the lowermost I-78 bridge
Black Brook (Polktown)	Entire length
Black River – see Lamington River	
Boulder Hill Brook (Tewksbury)	Entire length
Burnett Brook (Ralston)	Entire length
Capoolong (Cakepoulin) Creek (Sydney)	Entire length
Cold Brook (Oldwick)	Entire length
Dawsons Brook (Ironia)	Entire length
Drakes Brook (trib.)(Mt. Olive)	Source downstream to Central Railroad bridge
Electric Brook (Schooley's Mtn.)	Entire length
Flanders Brook (Flanders)	Entire length
Frog Hollow Brook (Califon)	Entire length
Gladstone Brook (St. Bernards School)	Entire length
Guinea Hollow Brook (Tewksbury)	Entire length
Hacklebarney Brook (Hacklebarney)	Entire length
Herzog (Lomerson) Brook (Pottersville)	Entire length
Hickory Run (Califon)	Entire length
Hollow Brook (Pottersville)	Entire length
India Brook (Randolph Twp.)	Entire length

	Krueger's (Creek) Brook (Flanders)	Entire length
	Lamington (Black) River (Pottersville)	Confluence with Rhinehart Brook to Camp Brady bridge, Bedminster
	Lamington (Black) River (trib.)(Ironia)	Source downstream to, but not including, Bryant Pond
	Ledgewood Brook (Ledgewood)	Entire length
	Little Brook (Califon)	Entire length
	Lomerson Brook – see Herzog Brook	
	Mine Brook (trib.)(E. of Mine Mtn.)	Entire length
	Mine Brook (trib.)(S. of Mine Mtn.)	Source downstream to Douglass Road bridge
	Mulhockaway Creek (Pattenburg)	Entire length
	Norton Brook (Norton)	Entire length
	Oakdale Creek (Chester)	Entire length
	Peapack Brook (Gladstone)	Entire length
	Raritan River, N/Br. (Pleasant Valley)	Source to, but not including, Ravine Lake (also see India Brook)
	Raritan River, S/Br. (Middle Valley)	Confluence with Turkey Brook to Rt. 512 bridge
	Raritan River, S/Br. (trib.)(Long Valley)	Entire length
	Raritan River, S/Br. (trib.)(S. of Hoffmans)	Entire length
	Raritan River, S/Br. (trib.)(S. of Schooleys Mtn.)	Entire length
	Rinehart Brook (Hacklebarney)	Entire length
	Rockaway Creek (N/Br.)(Mountainville)	Source to Rt. 523 bridge
	Rockaway Creek, S/Br. (Clinton)	Headwaters to Readington Township boundary, including all tributaries
	Rocky Run (Lebanon Twp.)	Entire length
	Round Valley Reservoir (Clinton)	-
	Spruce Run (Glen Gardner)	Source to, but not including, Spruce Run Reservoir
	Stony Brook (Washington)	Entire length
	Sun Valley Brook (Mt. Olive)	Entire length
	Teetertown Brook (Lebanon)	Entire length
	Trout Brook (Hacklebarney)	Entire length
	Turkey Brook (Mt. Olive)	Entire length
	Willoughby Brook (Buffalo Hollow)	Entire length

<u>Trout Maintenance Waters</u>

**	Beaver Brook (Annandale)	Reformatory Road bridge to Beaver Avenue bridge
	Beaver Brook (Clinton)	Lower most I-78 bridge downstream to the S/Br. Raritan River
	Black River – see Lamington River	
	Budd Lake (trib.)(E. of Budd Lake)	Entire length
	Buskill Brook (Flemington)	Source and tributary downstream to Rt. 31 bridge
**	Drakes Brook (Ledgewood)	Source downstream to Hillside Ave. bridge
	Green Brook (Watchung)	Source to Rt. 22 bridge

**	Lamington River (Milltown)	Rt. 206 bridge to confluence with Rinehart Brook
	Lamington River (Vliettown)	Camp Brady bridge to Rt. 523 bridge
**	McVickers Brook (Mendham)	Entire length
	Middle Brook, E/Br. (Springdale)	Entire length
	Prescott Brook (Stanton Station)	Entire length
	Raritan River, N/Br. (Far Hills)	Ravine Lake dam to Rt. 512 bridge
**	Raritan River, S/Br. (Mt. Olive)	Dam (located 390 feet upstream of the Flanders-Drakestown Road bridge) to confluence with Turkey Brook
	Raritan River, S/Br. (Califon)	Rt. 512 bridge downstream to downstream end of Packers Island
	Raritan River, S/Br. (trib.)(High Bridge)	Entire length
	Rockaway Creek, N/Br. (Whitehouse)	Rt. 523 bridge to confluence with S/Br. Rockaway Creek
	Rockaway Creek, S/Br. (Clinton/ Whitehouse)	Readington Township boundary to confluence with N/Br. Rockaway Creek, excluding Lake Cushetunk
	Spruce Run (Clinton)	Spruce Run Reservoir dam to S/Br. Raritan River
	Spruce Run Reservoir (Union)	-
	Walnut Brook (Flemington)	Entire length

<u>Non-trout Waters</u>

*	Allerton Creek (Allerton)	Entire length
	Ambrose Brook (Piscataway)	Entire length
	Assiscong Creek (Flemington)	Entire length
	Back Brook (Vanliew's Corners)	Entire length
	Barclay Brook (Redshaw Corners)	Entire length
	Bear Brook (West WIndsor)	Entire length
	Beden Brook (Montgomery)	Entire length
	Black River – see Lamington River	
*	Blue Brook (Mountainside)	Entire length
	Bound Brook (Dunellen)	Entire length
**	Budd Lake (trib.)(W. of Budd Lake)	Entire length
	Buskill Brook (Flemington)	Rt. 31 bridge downstream to S/Br. Raritan River
	Cedar Brook (Spotswood)	Entire length
	Chambers Brook (Whitehouse)	Entire length
*	Cramers Creek (Hamden)	Entire length
	Cranbury Brook (Old Church)	Entire length
	Cruser Brook (Montgomery)	Entire length
	Deep Run (Old Bridge)	Entire length
	Devils Brook (Schalks)	Entire length
**	Drakes Brook (Flanders)	Hillside Avenue bridge to confluence with S/Br. Raritan River
	Duck Pond Run (Port Mercer)	Entire length
	Dukes Brook (Somerville)	Entire length
**	Flanders Canal (Flanders)	Entire length

	Gander Brook (Manalapan)	Entire length
	Grandin Brook – see Sidney Brook	
	Green Brook (Plainfield)	Rt. 22 bridge to Bound Brook
	Heathcote Brook (Kingston)	Entire length
	Holland Brook (Readington)	Entire length
	Hoopstick Brook (Bedminster)	Entire length
	Ireland Brook (Paulus Corner)	Entire length
	Iresick Brook (Spotswood)	Entire length
**	Lamington (Black) River (Succasunna)	Source downstream to Rt. 206 bridge
	Lamington (Black) River (Burnt Mills)	Rt. 523 to N/Br. Raritan River
	Lawrence Brook (Deans)	Entire length
	Manalapan Brook (Jamesburg)	Entire length
	Matchaponix Brook (Mount Mills)	Entire length
	McGellairds Brook (Englishtown)	Entire length
	Middle Brook, W/Br. (Martinsville)	Entire length
	Middle Brook (Bound Brook)	Confluence of East and West branches to Raritan River
	Middle Brook (Greater Cross Roads)	Entire length
	Milford Brook (Lafayette Mills)	Entire length
	Millstone River (Hightstown)	Entire length
	Mine Brook (Mine Brook)	Entire length
	Neshanic River (Reaville)	Entire length
	Oakeys Brook (Deans)	Entire length
	Peters Brook (Somerville)	Entire length
	Pike Run (Belle Meade)	Entire length
	Pine Brook (Clarks Mills)	Entire length
	Pleasant Run (Readington)	Entire length
	Raritan River (Bound Brook)	From confluence of North and South branches to Landing Lane bridge, New Brunswick
	Raritan River, N/Br. (Bedminster)	Rt. 512 bridge to confluence with S/Br. Raritan River
**	Raritan River, S/Br. (Mt. Olive)	Source downstream to the dam that is 390 feet upstream of the Flanders-Drakestown Road bridge
	Raritan River, S/Br. (Neshanic Station)	Downstream end of Packers Island to confluence with N/Br. Raritan River
	Raritan River, S/Br. (trib.)(E. of Three Bridges)	Entire length
	Raritan River, S/Br. (trib.)(Holcomb Mills)	Entire length
	Raritan River, S/Br. (trib.)(W. of Three Bridges)	Entire length
	Rock Brook (Montgomery)	Entire length
	Rockaway Creek (Whitehouse)	Confluence of North and South Branches to Lamington River
	Royce Brook (Manville)	Entire length
+	Sidney Brook (Grandin)	Entire length

	Simonson Brook (Griggstown)	Entire length
	Six Mile Run (Franklin Church)	Entire length
	Spooky Brook (Bound Brook)	Entire length
	Stony Brook (Hopewell)	Entire length
	Stony Brook (Watchung)	Entire length
**	Tanners Brook (Washington)	Entire length
	Ten Mile Run (Franklin)	Entire length
	Tennent Brook (Old Bridge)	Entire length
	Tepehemus Brook (Manalapan)	Entire length
**	Turtleback Brook (Middle Valley)	Entire length
	Weamaconk Creek – see Matchaponix Brook	
	Wemrock Brook (Millhurst)	Entire length

Salem River (Creek) Drainage

<u>Non-trout Waters</u> — Entire drainage

Shark River Drainage

<u>Trout Maintenance Waters</u>

	Shark River (Neptune)	Rt. 33 bridge to Remsen Mill Road

<u>Non-trout Waters</u>

*	Jumping Brook (Neptune)	Entire length
*	Reevy Branch (Reevytown)	Entire length (source to confluence with Shark River)
*	Shark River (Colts Neck)	Source to Rt. 33
	Shark River (Glendola)	Remsen Mill Road to Atlantic Ocean

Shrewsbury River Drainage

<u>Non-trout Waters</u> — Entire drainage

Stow Creek Drainage

<u>Non-trout Waters</u> — Entire drainage

Toms River Drainage

<u>Trout Maintenance Waters</u>

	Toms River (Van Hiseville/ Whitesville/ Manchester)	Rt. 528 bridge (Cassville) to Rt. 571 bridge in Whitesville

Non-trout Waters

Davenport Brook (Berkeley)	Entire length
* Dove's Mill Branch (Holmansville)	Entire length
Jakes Branch (Berkeley)	Entire length
* Long Brook (Jackson Twp.)	Entire length
* Maple Root Branch (Jackson)	Entire length
* Toms River (Holmeson)	Source to Rt. 528 bridge, Cassville
Toms River (Toms River)	Rt. 571 to Barnegat Bay

Tuckahoe River Drainage

Non-trout Waters	Entire drainage

Wallkill River Drainage

Trout Production Waters

Franklin Pond Creek (Hardyston Twp.)	Entire length (source to, but not including Franklin Pond)
Mud Pond Outlet Stream (Hamburg)	Entire length (from the Mud Pond dam downstream to confluence with Hamburg Creek)
Sparta Glen Brook (Sparta)	Entire length
Wallkill River (trib.)(Ogdensburg)	Tributary from the outlet of Heaters Pond to the confluence with the Wallkill River)
Wallkill River (trib.)(Sparta)	Lake Saginaw dam downstream to Wallkill River

Trout Maintenance Waters

Clove Creek (Colesville)	Entire length
Clove Brook (Wantage)	Source to, but not including, Clove Acres Lake
Hamburg Creek (Hamburg Mtn.)	Source to Rt. 517 bridge, Rudeville
Lake Rutherford (Wantage)	-
Papakating Creek (Frankford)	Source to Rt. 629 bridge
Quarryville Brook – see Willow Brook	
Wallkill River (Franklin)	Sparta Glen Brook to, but not including, Franklin Pond
White Lake (Sparta)	-
Willow (Quarryville) Brook (Wantage)	Entire length

Non-trout Waters

Beaver Run (Wantage)	Entire length
Clove Brook (Sussex)	Clove Acres Lake to Papakating Creek
Hamburg Creek (Hardistonville)	Rt. 517 bridge to Wallkill River
Hanford Brook (Hanford)	Entire length within New Jersey
Papakating Creek (Wantage)	Rt. 629 bridge downstream to Wallkill River
Papakating Creek (trib.)(Pellettown)	Entire length

Papakating Creek, W/Br. (Wantage)	Entire length
* Wallkill River (Sparta)	Source to confluence with Sparta Glen Brook
Wallkill River (Wantage)	Outlet of Franklin Pond to State line
Wantage Brook (Wantage)	Entire length
Wildcat Brook (Franklin)	Entire length

Wreck Pond Creek Drainage

Non-trout Waters	Entire drainage

PART TWO

List of New Jersey Trout Production Waters with Resident Reproducing Trout Species Identified

	Trout Species		
	Brook	Brown	Rainbow
Big Timber Creek Drainage			
Masons Run (Pine Hill)	x		
Delaware River (Hunterdon Co.) Drainage			
Delaware River (trib.)(Holland)		x	
Hakihokake Creek (Milford)		x	
Hakihokake Creek (trib.)(Wydner)		x	
Little York (Brook) Creek (Little York)		x	
Spring Mills Brook (Milford)		x	
Warford Creek (Barbertown)		x	
Delaware River (Sussex Co.) Drainage			
Clove (Mill) Brook (Montague)		x	
Sandyston Creek (Sandyston)	x		
Shimers Brook (Millville)	x		
White Brook (Montague)	x		
Delaware River (Warren Co.) Drainage			
Buckhorn Creek (Hutchinson)		x	
Delawanna Creek (Delaware)		x	
Delaware River (trib.)(Knowlton)		x	
Dunnfield Creek (Del. Water Gap)	x	x	
Knowlton Brook (Knowlton)		x	
Lommasons Glen Brook (Lommasons Glen)	x		
Lopatcong Creek (Allen Mills)	x	x	
Lopatcong Creek (Phillipsburg)		x	
Lopatcong Creek (trib.)(Uniontown)	x		
Pophandusing Creek (Hazen)		x	
Stony Brook (Knowlton)	x	x	
Van Campens Brook (Millbrook)	x	x	x
Flat Brook Drainage			
Beerskill (Shaytown)	x		
Big Flat Brook (Sandyston)	x	x	
Big Flat Brook (trib.)(Tuttles Corner)	x		
Flat Brook (Blewett Tract)		x	
Forked Brook (Stokes S.F.)	x		

	Trout Species		
	Brook	Brown	Rainbow
Little Flat Brook (Layton)	x	x	
Parker Brook (Montague)	x		
Shawanni Creek (Stokes S.F.)	x		
Stony Brook (Stokes S.F.)	x		
Tillman Brook (Walpack)	x		
Tuttles Corner Brook (Tuttles Corner)	x		
Hackensack River Drainage			
Cresskill Brook (Alpine)	x		
Musconetcong River Drainage			
Beatty's Brook (Penwell)	x	x	
Bowers Brook (Hackettstown)	x		
Hances Brook (Rockport)	x		
Kurtenbach's Brook (Waterloo)	x		
Mine Brook (Mt. Olive)	x	x	
Mine Brook (trib.)(Drakestown)	x		
Mine Brook (trib.)(Washington)	x		
Musconetcong River (trib.)(Anderson)	x		
Musconetcong River (trib.)(Changewater)	x	x	
Musconetcong River (trib.)(Franklin)	x	x	
Musconetcong River (trib.)(Lebanon)	x		
Musconetcong River (trib.)(Port Murray)	x	x	
Musconetcong River (trib.)(S. of Point Mtn.)	x	x	
Musconetcong River (trib.)(S. of Schooley's Mtn. Brook)	x		
Musconetcong River (trib.)(Waterloo)	x		
Schooley's Mtn. Brook (Schooley's Mtn.)	x		
Stephensburg Creek (Stephensburg)	x		
Turkey Hill Brook (Bethlehem)		x	
West Portal (Brook) Creek (West Portal)	x	x	
Passaic River Drainage			
Apshawa Brook (Macopin)		x	
Bear Swamp Brook (Mahwah)	x		
Beaver Brook (Meriden)	x		
Beaver Brook (tribs.)(Meriden)	x		
+ Beech Brook (West Milford)	x		
Blue Mine Brook (Wanaque)	x		
Burnt Meadow Brook (Stonetown)	x		
Clinton Brook (W. Milford)		x	
Cooley Brook (W. Milford)	x		
Crooked Brook (trib.)(E. of Sheep Hill)	x		

	Trout Species		
	Brook	Brown	Rainbow
Den Brook (trib.)(Randolph)	x		
Green Brook (West Milford)	x		
Green Pond Brook (Picatinny Arsenal)	x		
Harmony Brook (Brookside)		x	x
Havemeyer Brook (Mahwah)	x		
Hewitt Brook (West Milford)	x		
Hibernia Brook (Marcella)	x		
Hibernia Brook (trib.)(Lake Ames)	x		
High Mountain Brook (Ringwood)	x		
Indian Grove Brook (Bernardsville)			x
Jackson Brook (Mine Hill)		x	
Jennings Creek (W. Milford)	x		
Kanouse Brook (Newfoundland)	x		
Lake Stockholm Brook (Stockholm)	x		
Little Pond Brook (Oakland)	x	x	
Macopin River (Newfoundland)		x	
Meadow Brook (Wanaque)		x	
Mill Brook (Randolph)		x	
Mill Brook (trib.)(N. of Union Hill)		x	
Mossmans Brook (W. Milford)		x	
Passaic River (Mendham)		x	x
Pequannock River (Vernon)	x		
Pequannock River (Hardyston)		x	
Pequannock River (Newfoundland)		x	
Pequannock River (Kinnelon)		x	
Pequannock River (trib.)(Copperas Mtn.)	x	x	
+ Pequannock River (trib.)(Maple Lake)		x	
Pequannock River (trib.)(Smoke Rise)	x		
Preakness (Singac) Brook (Wayne)	x		
Primrose Brook (Harding)	x	x	
Ramapo River (trib.)(Oakland)	x		
Russia Brook (trib.)(S. of St. Paul)	x		
Saddle River (Upper Saddle River)		x	
Stag (Clove) Brook (Mahwah)	x		
+ Stone House Brook		x	
Wallace Brook (Randolph)		x	
Wanaque River (trib.)(S. of Jennings Creek)	x		
West Brook (W. Milford)			x
Whippany River (Brookside)		x	x
Whippany River (trib.)(Brookside)		x	x
Whippany River (trib.)(Gillespie Hill)			x

	Trout Species		
	Brook	Brown	Rainbow
Paulins Kill River Drainage			
Paulins Kill, E/Br. (Lafayette)			x
Paulins Kill (trib.)(Emmons Sta.)		x	
Paulins Kill (trib.)(Stillwater Sta.)	x		
Trout Brook (Middleville)		x	
Yards Creek (Blairstown)		x	
Pequest River Drainage			
Barkers Mill Brook (Independence)	x		
Bear Brook (Johnsonburg)	x		
Furnace (Oxford) Brook (Oxford)		x	
Independence Creek (Alphano)	x		
Pequest River (trib.)(Petersburg)	x		
Trout Brook (Tranquility)	x		
Tunnel Brook (Oxford Mtn.)	x		
Pochuck River Drainage			
Black Creek (trib.)(McAfee)	x		
Livingston Ponds Brook (Wawayanda S.P.)	x	x	
Spring Brook (Maple Grange)	x		
Pohatcong Creek Drainage	x	x	
Brass Castle Creek (Brass Castle)	x	x	
Halfway House Brook (Franklin)	x		
Merrill Creek (Harmony)	x		
Mill Brook (Broadway)	x		
Pohatcong Creek (Mansfield)		x	
Pohatcong Creek (Springtown)		x	
Pohatcong Creek (trib.)(Greenwich)	x	x	
Pohatcong Creek (trib.)(New Village)	x		
Pohatcong Creek (trib.)(Willow Grove)	x		
Raritan River Drainage			
Beaver Brook (Cokesbury)		x	
Black Brook (Polktown)		x	x
Black River – see Lamington River		x	
Boulder Hill Brook (Tewksbury)		x	
Burnett Brook (Ralston)		x	
Capoolong (Cakepoulin) Creek (Sydney)		x	
Cold Brook (Oldwick)		x	
Dawsons Brook (Ironia)		x	
Drake's Brook (trib.)(Mt. Olive)	x		

	Trout Species		
	Brook	Brown	Rainbow
Electric Brook (Schooley's Mtn.)	x	x	
Flanders Brook (Flanders)	x	x	x
Frog Hollow Brook (Califon)	x		
Gladstone Brook (St. Bernards School)		x	
Guinea Hollow Brook (Tewksbury)		x	
Hacklebarney Brook (Hacklebarney)	x		
Herzog (Lomerson) Brook (Pottersville)	x	x	
Hickory Run (Califon)			x
Hollow Brook (Pottersville)	x	x	
India Brook (Randolph Twp.)	x	x	
Krueger's (Creek) Brook (Flanders)	x		
Lamington (Black) River (Pottersville)		x	
Lamington (Black) River (trib.)(Ironia)	x		
Ledgewood Brook (Ledgewood)		x	
Little Brook (Califon)	x		
Mine Brook (trib.)(E. of Mine Mtn.)	x		
Mine Brook (trib.)(S. of Mine Mtn.)	x		
Mulhockaway Creek (Pattenburg)	x	x	x
Norton Brook (Norton)	x		
Oakdale Creek (Chester)	x		
Peapack Brook (Gladstone)		x	
Raritan River, N/Br. (Pleasant Valley)		x	
Raritan River, S/Br. (Middle Valley)	x	x	
Raritan River, S/Br. (trib.)(Long Valley)	x		
Raritan River, S/Br. (trib.)(S. of Hoffmans)	x		
Raritan River, S/Br. (trib.)(S. of Schooleys Mtn.)	x		
Rinehart Brook (Hacklebarney)	x	x	
Rockaway Creek (N/Br.)(Mountainville)	x	x	
Rockaway Creek (S/Br.)(Lebanon)		x	
Rocky Run (Lebanon Twp.)	x		
Round Valley Reservoir (Clinton)		- - (lake trout) - -	
Spruce Run (Glen Gardner)	x	x	
Stony Brook (Washington)	x	x	
Sun Valley Brook (Mt. Olive)	x		
Teetertown Brook (Lebanon)	x	x	
Trout Brook (Hacklebarney)	x		
Turkey Brook (Mt. Olive)	x		
Willoughby Brook (Buffalo Hollow)	x	x	
Wallkill River Drainage			
Franklin Pond Creek (Hardyston Twp.)	x	x	
Mud Pond Outlet Stream (Hamburg)	x		

Trout Species

	Brook	Brown	Rainbow
Sparta Glen Brook (Sparta)	x		
Wallkill River (trib.)(Ogdensburg)	x		
Wallkill River (trib.)(Sparta)	x		

+ Listing of this stream as trout production in the NJDEP Surface Water Quality Standards may be proposed in the future. See Part Four for list of potential reclassifications.

NOTE: Some of the streams listed in Part Two are not trout production streams for their entire length. See Part One and Part Three for further information.

PART THREE

Potential Reclassifications of New Jersey Trout Waters as related to Their Suitability for Trout

Drainage and Waterbody Description	Current Classification[1]	Potential Classification
Passaic River Drainage		
Beech Brook (West Milford) Entire length, including headwaters and tributaries	Trout Maintenance	Trout Production
Peckman River (Verona) From a point 1,300 feet (straight line distance) upstream of Ozone Avenue bridge to Main Street bridge	Nontrout	Trout Maintenance
Pequannock River (trib.) (Maple Lake) Entire length, including all tributaries	[Trout Production]	Trout Production
Saddle River (Upper Saddle River) County Rt. 2 (Lake Street) bridge downstream to confluence with Pleasant Brook	Trout Maintenance	Trout Production
Stone House Brook (Butler) (a.k.a. Kikeout Brook) Valley Road bridge downstream to confluence with Pequannock River	Nontrout	Trout Production
Paulinkill River Drainage		
Paulinkill River (trib) (E. of Hainesburg Station) Entire length	[Trout Maintenance]	Trout Maintenance
Paulinkill River (trib) (E. of Vail) Source downstream to confluence with outlet stream of Lake Susquehanna	[Trout Maintenance]	Trout Maintenance
Raritan River Drainage		
Sidney Brook (Grandin) Headwaters downstream to Rt. 513 bridge, including all tributaries	Nontrout	Trout Maintenance

[1] Brackets around a current classification indicate that the waterbody is not specifically named or listed in Part One and has, therefore, by default, assumed the classification given herein (see the "General Explanation" in Part 1 for instructions for classification of unlisted waters).

New Jersey Division of Fish and Wildlife

List of Waters Stocked with Trout by the New Jersey Division of Fish and Wildlife - 2008

General Explanation

The New Jersey Division of Fish and Wildlife (NJDFW) annually stocks trout in waters throughout the state. Trout-stocked waters are designated in the Fish Code (N.J.A.C. 23:25-6) which is adopted each year by the New Jersey Fish and Game Council, pursuant to the authority of N.J.S.A. 13:1B-29 et seq. and N.J.S.A. 23:1-1 et seq. The list of trout-stocked waters may change slightly from year to year in reponse to program changes. A copy of the Fish Code may be obtained from the NJDFW and is also available in summary form in the of the Fish & Wildlife Digest (freshwater fishing edition) that is available wherever fishing licenses are sold (i.e. sporting goods stores, etc).

In the Fish Code, designated trout-stocked waters are listed by county. Individual names (and occasionally the spelling) of trout-stocked waters may follow local tradition. These names may not appear as such on U.S.G.S. quadrangles, county or state maps, etc. and further, may not be identified in the Surface Water Classification Tables (promulgated under N.J.A.C. 7:9B-1.15). This has made it difficult for regulators, consultants, and others to determine if a water is trout-stocked and in need of further consideration in accordance with New Jersey Department of Environmental Protection regulations. The list below was developed as a companion to another NJDFW document entitled "Classification of N.J. Trout Waters as Related to Their Suitability for Trout". In both of these documents, the listed waters are organized by watershed (rather than by county) and for consistency the nomenclature found the Surface Water Classification Tables is used.

The season(s) during which trout are stocked is indicated by the following letter(s) which precede a listed water.

S Spring – Stocking occurs over a ten week period, generally beginning in mid-March and continuing through May.

F Fall – Stocking occurs over a two week period, generally commencing the second week in October.

W Winter – Stocking occurs during the three days immediately preceding Thanksgiving Day.

Alloway Creek Drainage

None

Assiscunk Creek Drainage

None

Assunpink Creek Drainage

S	Assunpink Creek (Lawrence/Hamilton Twps.)	Assunpink Site 5 dam upstream of Rt. 130 bridge to Carnegie Rd., Hamilton Twp.
S/F	Colonial Lake (Lawrence Twp.)	Entire waterbody

Atlantic Ocean (Atlantic Co.) Drainage

S	Heritage Pond (Absecon)	Entire waterbody

Atlantic Ocean (Cape May Co.) Drainage

S	West Pond (Cape May Court House)	Entire waterbody

Atlantic Ocean (Monmouth Co.) Drainage

S/W	Spring Lake (Spring Lake)	Entire waterbody
S	Takanassee Lake (Long Branch)	Entire waterbody

Arthur Kill (Middlesex Co.) Drainage

None

Delaware Bay (Cumberland Co.) Drainage

None

Arthur Kill (Union Co.) Drainage

None

Barnegat Bay (Ocean Co.) Drainage

None

Big Timber Creek Drainage

S/F	Grenloch Lake (Turnersville)	Entire waterbody

S/W	Rowands Pond (Clementon)	Entire waterbody
S	Westville Lake (Westville)	Entire waterbody

<u>Blacks Creek Drainage</u>

None

<u>Cedar Creek Drainage</u>

None

<u>Cohansey Creek Drainage</u>

S	Cohansey River (Bridgeton)	Dam at Seeleys Pond to powerline above Sunset Lake, Bridgeton
S/F	Mary Elmer Lake (Bridgeton)	Entire waterbody

<u>Cooper Creek Drainage</u>

None

<u>Crosswicks Creek Drainage</u>

S	Prospertown Lake (Prospertown)	Entire waterbody

<u>Delaware Bay (Cape May Co.) Drainage</u>

S	Dennisville Lake (Dennisville)	Entire waterbody
S/W	Shaws Mill Pond (Newport)	Entire waterbody

<u>Delaware and Raritan Canal (Mainstem and Feeder)</u>

S	Delaware – Raritan Canal (Hunterdon/Mercer Counties)	Feeder Canal (Lambertville) - Bulls Island to Upper Ferry Road bridge
S	Delaware – Raritan Canal Mainstem (Trenton)	Mulberry Street, Trenton to Alexander Street, Princeton

<u>Delaware River (Burlington Co.) Drainage</u>

S/F	Crystal Lake (Willingboro)	Entire waterbody
S/F	Sylvan Lake (Burlington)	Entire waterbody

<u>Delaware River (Camden Co.) Drainage</u>

S	Gloucester City Pond (Gloucester)	Entire waterbody
S/W	Haddon Lake (Audubon)	Entire waterbody

Delaware River (Gloucester Co.) Drainage

S/F	Greenwich Lake (Gibbstown)	Entire waterbody

Delaware River (Hunterdon Co.) Drainage

	Everittstown Brook - see Nishisakawick Creek	
	Frenchtown Brook - see Nishisakawick Creek	
S	Hakihokake Creek (Milford) (a.k.a. Milford Brook)	Entire length
S	Hakihokake Creek (trib.)(Wydner)	Entire length (stocked as part of Hakihokake Ck.)
S	Lockatong Creek (Kingwood/Raven Rock)	Entire length
S	Nishisakawick Creek (Frenchtown) (a.k.a. Everittstown Brook/ Frenchtown Brook)	Entire length
S	Spring Mills Brook (Spring Mills/Milford)	Entire length
S	Wickecheoke Creek (Stockton)	Covered Bridge (Rt. 604), Sergentsville, to Delaware R.

Delaware River (Mercer Co.) Drainage

None

Delaware River (Salem Co.) Drainage

S/W	Riverview Beach Pond (Pennsville)	Entire waterbody

Delaware River (Sussex Co.) Drainage

S	Blue Mountain Lake (Delaware Water Gap NRA)	Entire waterbody

Delaware River (Warren Co.) Drainage

S	Buckhorn Creek (Hutchinson)	Entire length
S	Lopatcong Creek (Herkers Hollow/Phillipsburg)	Rt. 519 bridge to South Main Street, Phillipsburg
S	Pophandusing Creek (Hazen/Belvidere)	Oxford Road, Hazen to Delaware River

Elizabeth River Drainage

None

Flat Brook Drainage

S	Big Flat Brook (Montague & Sandyston Twps)	Entire length (Saw Mill Pond to confluence with Flat Brook) – see also Flat Brook
S/F	Flat Brook (Flatbrook-Roy/Flatbrookville)	Entire length - see also Big Flat Brook Walpack)
S/W	Lake Ocquittunk (Stokes S.F.)	Entire waterbody
S	Little Flat Brook (High Point S.P./Layton)	Entire length
S	Sawmill Pond (High Point) (a.k.a. Saw Mill Lake)	Entire waterbody
S	Stony Lake (Stokes S.F.)	Entire waterbody

Forked River Drainage

None

Great Egg Harbor River Drainage

S/W	Birch Grove Park Pond (Northfield)	Entire waterbody
S/F	Oak Pond (Sicklerville)	Entire waterbody
S	Pohatcong Lake (Tuckerton)	Entire waterbody

Hackensack River Drainage

S	Hackensack River (Old Tappan)	Lake Tappan to Harriot Ave., Harrington Park
S/W	Mill Pond (Park Ridge)	Entire waterbody
S	Pascack Creek (Hillsdale)	Orchard Street, Hillsdale to Lake Street, Westwood
S	Tenakill Brook (Demarest)	Entire length
	Tienakill Creek – see Tenakill Brook	

Hudson River Drainage

S/W	Woodcliff Lake (North Bergen)	Entire waterbody (J.J. Braddock Park)

Little Egg Harbor (Manahawkin Bay) Drainage

None

Manasquan River Drainage

S	Mac's Pond (Manasquan)	Entire waterbody
S/F	Manasquan River (Farmingdale)	Rt. 9 bridge downstream to Bennetts Bridge, Manasquan WMA
S	Mingamahone Brook (Farmingdale/Allaire	Hurley Pond Road to Manasquan River

S.P.)

Mantua Creek Drainage

None

Maurice River Drainage

S/F	Iona Lake (Iona)	Entire waterbody
S/F	Giampetro Park Lake (Vineland)	Entire waterbody
S/F	Maurice River (Vineland)	Willow Grove Lake dam downstream to Sherman Avenue bridge, Vineland

Metedeconk River Drainage

S	Echo Lake (Southard)	Entire waterbody
S/F	Metedeconk River (N/Br.)(Lakewood)	Aldrich Road bridge downstream to Ridge Ave.
S/F	Metedeconk River (S/Br.)(Lakewood)	Bennetts Mill dam to twin wooden foot bridge, opposite Lake Park Blvd. on South Lake Drive, Lakewood
S/W	Lake Shenandoah (Lakewood)	Entire waterbody

Morses Creek Drainage

None

Mullica River Drainage

S/F	Hammonton Lake (Hammonton)	Entire waterbody

Musconetcong River Drainage

	Hatchery Brook – see Trout Brook	
S	Lake Hopatcong (Hopatcong)	Entire waterbody
S	Lake Musconetcong (Netcong)	Entire waterbody
S	Lubbers Run (Byram)	Entire length
S/F	Musconetcong River (Hackettstown)	Lake Hopatcong dam downstream to Delaware River, including all mainstem impoundments except Lake Musconetcong
S	Trout Brook (Hackettstown)	Entire length (including Hatchery Brook)

Navesink River Drainage

S	Garvey's Pond (Navesink)	Entire waterbody
S	Hockhocksen Brook (Colts Neck Twp.)	Hockhocksen Road to Garden State Parkway

		(northbound)
S	Holmdel Park Pond (Holmdel)	Entire waterbody
S	Mohawk Pond (Red Bank)	Entire waterbody
S	Shadow Lake (Red Bank)	Entire waterbody
S	Yellow Brook (Colts Neck)	Heyers Mill Road to Muhlenbrink Road

<u>Newark Bay (Essex Co.) Drainage</u>

None

<u>Newark Bay (Hudson Co.) Drainage</u>

None

<u>Newark Bay (Union Co.) Drainage</u>

None

<u>Oldmans Creek Drainage</u>

S	Harrisonville Lake (Harrisonville)	Entire waterbody

<u>Oyster Creek Drainage</u>

None

<u>Passaic River Drainage</u>

S/W	Barbour's Pond (West Paterson)	Entire waterbody
S	Beaver Brook (Rockaway Twp.)	Entire length
S	Branch Brook Park Lake (Newark)	Entire waterbody
S	Burnham Park Pond (Morristown)	Entire waterbody
S	Clarks Pond (Bloomfield)	Entire waterbody
S	Clinton Reservoir (W. Milford)	Entire waterbody
S	Dahnert's Lake (Garfield)	Entire waterbody
S/W	Green Turtle Pond (Wamaque Wildlife Mgmt. Area)	Entire waterbody
S	Hibernia Brook (Hibernia)	Entire length
S	Hohokus Brook (Hohokus)	Whites Pond to confluence w/ Saddle R.
S	Indian Lake (Little Ferry)	Entire waterbody
S/W	Mt. Hope Pond (Mt. Hope)	Entire waterbody
S	Oldham Pond (North Haledon)	Entire waterbody
S	Passaic River (Millington)	White Bridge Road to Rt. 24, Chatham
S	Pequannock River (Kinnelon/Butler/Riverdale)	Rt. 23, Smoke Rise to Paterson- Hamburg Turnpike in Pompton Lakes
S	Pompton River (Wayne)	Pompton Lake to Newark-Pompton Turnpike
S	Potash Lake (Oakland)	Entire waterbody

S/F	Ramapo River (Mahwah/Oakland)	State line downstream to Pompton Lake
S	Ringwood Creek (Ringwood/Sloatsburg) (a.k.a. Ringwood Brook)	State line to Sallys Pond, Ringwood S.P.
S/F	Rockaway River (Jefferson Twp./Boonton)	Longwood Lake dam (Jefferson Twp.) to Jersey City Reservoir in Boonton
S	Russia Brook (Milton)	Ridge Road to Lake Swannanoa
S	Saddle River (Saddle River)	Lake Streer downstream to Dunkerhook Road, Fairlawn
S	Scarlet Oak Pond (Mahwah)	Entire waterbody
S	Sheppard Lake (Ringwood State Park) (a.k.a. Shepherd Lake)	Entire waterbody
S/W	Speedwell Lake (Morristown)	Entire waterbody
S/W	Verona Park Lake (Verona)	Entire waterbody
S/F	Wanaque River (West Milford/Pompton Lakes)	Greenwood Lake dam to jct. with Pequannock River, excluding Wanaque Reservoir, Monksville Reservoir and Lake Inez
S	Whippany River (Brookside/Morristown)	Tingley Road, Morris Twp. to Ridgedale Avenue, Morristown
S	Whites Pond (Waldwick)	Entire waterbody
S	West Hudson County Park Pond (Harrison)	Entire waterbody

Paulins Kill Drainage

S	Alms House Pond (Hampton Twp.) (a.k.a. County Farm Pond)	Entire waterbody
S	Blair Creek (Hardwick Center)	Hardwick Center to Blair Lake
S	Blair Lake (Blairstown)	Entire waterbody
S	Columbia Lake (Columbia)	Lake and gatehole
S	Culver's Creek (Frankford) (a.k.a Culvers Lake Brook)	Entire length
	Culvers Lake Brook – see Culver's Creek	
S	Dry Brook (Branchville)	Entire length
S	Jacksonburg Creek (Blairstown)	Entire length
S/W	Little Swartswood Lake (Swartswood)	Entire waterbody
	Neldon Brook – see Swartswood Creek	
S/F	Paulins Kill (Blairstown)	Entire length (confluence of East and West branches downstream to Columbia Lake)
S/F	Paulins Kill (E/Br.)(Andover/Lafayette Twp.)	Limecrest RR spur downstream to confluence with Paulins Kill, W/Br.
S/F	Paulins Kill (W/Br.)(Newton)	Warbasse Jct. Road bridge (Rt. 663) to confluence with Paulins Kill, E/Br.
S	Pond Brook (Middleville)	Entire length
S	Swartswood Creek (Swartswood) (a.k.a. Neldon Brook)	Entire length
S	Swartswood Lake (Swartswood)	Entire waterbody
S	Trout Brook (Middleville)	Entire length

S	White Lake (Hardwick Twp.)	Entire waterbody

<u>Pennsauken Creek Drainage</u>

S	Laurel Pond (Mt. Laurel)	Entire waterbody

<u>Pequest River Drainage</u>

S	Andover Junction Brook (Andover)	Entire length
S	Beaver Brook (Hope)	Silver Lake dam to Pequest River
	Brookaloo Swamp (Hope) – see Honey Run	Entire length
S	Furnace Brook (Oxford)	Entire length
S/W	Furnace Lake (Oxford)	Entire waterbody
S	Honey Run (Hope)	Swayzes Mill Road to Rt. 519, including Brookaloo Swamp and Muddy Brook
	Lake Aeroflex – see New Wawayanda Lake	
S	Muddy Brook (Hope) – see Honey Run	
S/W	New Wawayanda Lake (Andover) (a.k.a. Lake Aroflex)	Entire waterbody
S/F	Pequest River (Belvidere/Whittingham/Vienna Townsbury/Pequest)	Source downstream to Delaware River
S	Trout Brook (Hope)	Entire length

<u>Pochuck Creek Drainage</u>

S	Glenwood Brook (Glenwood)	Outlet of Glenwood Lake downstream to State line
S	Wawayanda Creek (Vernon)	Entire length
S	Wawayanda Lake (Wawayanda)	Entire waterbody

<u>Pohatcong Creek Drainage</u>

S	Brass Castle Creek (Brass Castle) (a.k.a. Roaring Rock Brook)	Entire length
S	Merrill Creek Reservoir (Harmony Twp.)	Entire waterbody
S/F	Pohatcong Creek (Mansfield/Pohatcong)	Mt Bethel to Delaware River
	Roaring Rock Brook – see Brass Castle Creek	

<u>Raccoon Creek Drainage</u>

	Lake Nariticon – see Swedesboro Lake	
S/W	Mullica Hill Pond (Mullica Hill)	Entire waterbody
S/F	Swedesboro Lake (Swedesboro) (a.k.a Lake	Entire waterbody

Nariticon)

Rahway River Drainage

S	Rahway River (Rahway)	I-78 bridge, Springfield to St. George Ave. (Rt. 27), Rahway
S	Rahway River (Rahway W/B)	Campbell's Pond toGlen Ave.
S	Diamond Mill Pond (Milburn)	Entire waterbody
S	Milton Lake (Rahway)	Madison Hill Road bridge to Milton Lake dam
S	Warinanco Park Pond (Roselle)	Entire waterbody

Rancocas Creek Drainage

S	Pemberton Lake (Pemberton)	Entire waterbody
S	Rancocas Creek (SW/Br.)(Medford)	Mill Street Park to Branch Street bridge (Medford)

Raritan Bay (Middlesex Co.) Drainage

S/W	Hooks Creek Lake (Cheesequake S.P.)	Entire waterbody

Raritan Bay (Monmouth Co.) Drainage

None

Raritan River Drainage

S/W	Amwell Lake (East Amwell)	Entire waterbody
S	Beaver Brook (Cokesbury/Annandale)	Entire length
S	Capoolong (Cakepoulin) Creek (Sydney)	Entire length
S	Drakes Brook (Ledgewood/Flanders)	Entire length
S	Englishtown Mill Pond (Englishtown)	Entire waterbody
S/F	Farrington Lake (North Brunswick)	Entire waterbody
S	Green Brook (Watchung)	Rt. 527, Berkeley Heights to Rt. 22, Scotch Plains
S	India Brook (Randolph Twp.)	Mountainside Ave. to Rt. 24, Ralston
S	Ireland Brook (Paulus Corner)	Farrington Lake to point 500 feet upstream of Riva Ave.
S	Lake Papaianni (Edison)	Entire waterbody
S/F	Lamington (Black) River (Milltown/Pottersville)	Rt. 206 bridge (Chester) downstream to the posted Black River Fish & Game Club property at the lower end of Hacklebarney S.P.
S	Lamington River (Burnt Mills)	Rt. 523 (Lamington Road) at Burnt Mills downstream to N/Br. Raritan River
S	Lawrence Brook (Deans)	Dam at Farrington Lake to 2nd railroad bridge

		(Raritan Railroad) below Main Street, Milltown
S/W	Lower Echo Park Pond (Mountainside)	Entire waterbody
S	Manny's Pond	Entire waterbody
S	Middle Brook (E/Br.)(Springdale)	Entire length (Martinsville)
S	Mountain Farm Pond	Entire waterbody
S	Mulhockaway Creek (Pattenburg)	Entire length
S	Neshanic River (Reaville)	Kuhl Road to Rt. 514
S	Peapack Brook (Peapack-Gladstone)	Entire length
S	Raritan River (Raritan)	Confluence of North and South branches downstream to Rt. 206 bridge (Raritan)
S/F	Raritan River (N/Br.)(Bedminster)	Rt. 512 bridge, a.k.a. Peapack Rd., in Far Hills downstream to confluence with S/Br. Raritan River
S/F	Raritan River (S/Br.)(Califon/Flemington/ Neshanic Station)	Budd Lake dam to jct. with N/Br. Raritan River
S	Rock Brook (Montgomery Twp.)	Entire length (Zion)
S	Rockaway Creek (Whitehouse)	Entire length
S	Rockaway Creek (S/Br.)(Whitehouse)	Entire length
S/F	Roosevelt Park Pond (Edison)	Entire waterbody
S/F	Rosedale Lake (Rosedale)	Entire waterbody
S	Round Valley Reservoir (Clinton Twp.)	Entire waterbody
S	Seeleys Pond (Berkeley Heights)	Entire waterbody
S	Sidney Brook (Grandin) (a.k.a. Sydney Brook)	Entire length
S	Spooky Brook Park Pond (Franklin)	Entire length
S	Spruce Run (Glen Gardner)	Entire length
S	Stony Brook (Hopewell/Snydertown)	Woodsville to Port Mercer
	Sydney Brook – see Sidney Brook	Entire waterbody
S/W	Topenemus Lake (Freehold)	Entire waterbody

Salem Creek Drainage

S/F	Schadlers Sand Wash Pond (Penns Grove)	Entire waterbody

Shark River Drainage

S	Hamilton Fire Pond (Neptune)	Entire waterbody
S	Shark River (Neptune)	Rt. 33 bridge downstream to Remsen Mill Road

Shrewsbury River Drainage

None

Stow Creek Drainage

None

Toms River Drainage

S/F	Toms River (Van Hiseville/Manchester)	Rt. 528 bridge in Cassville downstream to confluence with Maple Root Branch and Rt. 70 bridge to Rt. 571 bridge

Tuckahoe River Drainage

None

Wallkill River Drainage

S	Clove Brook (Sussex)(a.k.a. Clove River)	Mt. Salem Road to Jct. of Rt. 23 and Mt. Salem Road to Rt. 565 bridge
	Clove River – see Clove Brook	
S	Franklin Pond Creek (Hardyston Twp.)	Entire length
S	Papakating Creek (Wantage)	Plains Road bridge to Rt. 565
S	Papakating Creek (W/Br.)(Wantage)	Entire length (Libertyville)
S/W	Silver Lake (Hamburg Mtn. Wildlife Management Area)	Entire waterbody
S/F	Wallkill River (Sparta/Franklin/Wantage)	Lake Mohawk dam to Rt. 23, Hamburg

Wreck Pond Creek Drainage

None

New Jersey Division of Fish and Wildlife

Locations of Anadromous American Shad and River Herring during Their Spawning Period in New Jersey's Freshwaters Including Known Migratory Impediments and Fish Ladders

March 2005

New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Bureau of Freshwater Fisheries
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Introduction

The majority of the information listed in this document was taken from, “Information On Anadromous Clupeid Spawning Runs In New Jersey” (Zich, 1978). The list addresses only river herring (alewife and blueback) and American shad. The presence or absence of these species is indicated on the identified drainages. Some additional spawning runs are included that were recently documented by the Division of Fish and Wildlife, Bureau of Freshwater Fisheries.

The list includes impediments (dams, and floodgates), fish ladder locations, and sections of identified drainage (culverts and bridge crossings) where anadromous clupeid spawning runs were documented or reported. **The waters are designated as either (c) confirmed spawning run or (r) reported spawning run.**

Several of the impediments listed have fish ladders incorporated into the dam or floodgate design. These locations are identified on the list. The fish ladders allow passage over the impediment to the next upstream barrier. Therefore, this list should be used in a way that considers spawning migrations to extend up to the next upstream barrier. Many of these upstream barriers have developing river herring and or American shad fisheries below that barrier.

Some of the barriers classified, as reported (r) should not be ruled out as candidates for fish ladders. It is likely that an area listed as “reported” does indeed support clupeid spawning migrations, however to date, the Division of Fish and Wildlife has not confirmed the presence of clupeids in these waterways.

It is noted and emphasized that <u>**all unlisted waters**</u> in each of the identified drainages <u>**have the potential to support anadromous fishes**</u> up to the first upstream barrier where suitable habitat is available.

*** Fish ladder recently installed (no confirmation of fish passage).**
**** Approved fish ladder (installation pending).**
+ Fish ladder installed with confirmed movement.

<u>Alloway Creek Drainage</u>

<u>Shad River herring</u>
Unnamed tributary – Laurel Lake Dam (Quinton) (r)
Deep Run – Elkington Mill Dam (Alloway) (c)
Alloway Creek – Alloway Lake Dam (Alloway) (c)

<u>Assiscunk Creek Drainage</u>

<u>Shad River herring</u>
Assiscunk Creek – Rt. 628 Bridge (Mansfield) (c) (c)

<u>Assunpink Creek Drainage</u>

<u>Shad River herring</u>

Assunpink Creek – Whitehead Pond Dam (Lawrence) (r)
Assunpink Creek – Assunpink Creek (Trenton) (c)

Atlantic Ocean (Atlantic Co.) Drainage

Shad River herring
Absecon Creek - Atlantic City Reservoir Dam (Absecon) (c)
Doughty Creek - East Pool (Oceanville) (c)
Doughty Creek - West Pool (Oceanville) (c)

Atlantic Ocean (Cape May Co.) Drainage

Shad River herring
Mill Creek – Magnolia Lake Dam (Ocean View) (c)
Taylor Creek – Taylor Creek (Rio Grande) (r)

Atlantic Ocean (Monmouth Co.) Drainage

Shad River herring
Atlantic Ocean – Deal Lake Dam (Asbury Park) (c)
Whale Pond Creek – Takanassee Lake Dam (Oakhurst) (c)

Arthur Kill (Middlesex & Union County Co.) Drainage

Shad River herring
Arthur Kill River - Entire length (c) (c)

Atlantic Ocean (Ocean Co.) Drainage

Shad River herring
Lake of Lilies Dam - (Bayhead Junction) (c)
Little Silver Lake Dam - (Point Pleasant Beach) (c)

Barnegat Bay (Ocean Co.) Drainage

Shad River herring
Cedar Creek – U.S.G.S Gage Dam (Lanoka Harbor) (c)
Cedar Creek – Rt. 9 (Cedar Beach) (c)
Double Creek – East Bay Ave. (Barnegat) (c)
Fresh Creek – Taylor Road (Beach View) (c)
Gunning River – Collinstown Road (Barnegat) (c)
Kettle Creek – Brick Blvd. (Cedarwood Park) (c)
Polhemus Creek – Hooper Ave. (Silverton) (c)
Potter Creek – Bluejay Ave. (Holly Park) (c)
Silver Bay Creek – Hooper Ave. (Silverton) (c)
S. Branch Double Creek – East Bay Ave. (Barnegat) (c)
S. Branch Stouts Creek – Bayside Pkwy. Culvert (Sunrise Beach) (c)
Tunes Branch – Brick Blvd. (Lake Riviera) (c)
Westecunk Creek – Stafford Forge Imp. (Stafford Forge) (r)

Big Timber Creek Drainage

Shad River herring

Big Timber Creek – lower (Glendora) (c) (c)
S. Br. Big Timber Creek- Blackwood Lake Dam (Blackwood) (r)
Almonesson Creek - Almonesson Lake Dam (r)

Cohansey River Drainage

Shad River herring
Cohansey River –lower- (Bridgeton) (c)
Mill Creek – Sheppards Mill Pond Dam (Springtown) (r)
Indian Fields Branch – East Lake Dam (Bridgeton) (r)
Mill Creek – Clarks Pond Dam (Bridgeton) (c)
Cohansey River –Sunset Lake Dam **(fish ladder+)** (Bridgeton) (c)
Cohansey River – Rocaps Run (r)

Cooper River Drainage

Shad River herring
Cooper River - Cooper River Park Lake **(fish ladder+)** (c) (c) (Collingswood)
Cooper River - Wallworth Pond Dam **(fish ladder*)** (r) (Haddonfield)
Cooper River - Evans Pond Dam **(fish ladder*)** (Haddonfield) (r)

Crosswicks Creek Drainage

Shad River herring
Crosswicks Creek - lower (White Horse) (c) (c)
Back Brook - Gropps Lake Dam **(fish ladder+)** (White Horse) (c)
Doctors Creek -Yardville/Groveville Road (Groveville) (c)
Crosswicks Creek - North Crosswicks Dam (Crosswicks) (c)

Delaware Bay (Cape May Co.) Drainage

Shad River herring
Dennis Creek - Dennisville Lake Dam (Dennisville) (c)
Dennis Creek - Ludlams Pond (r)
Dennis Creek - East Creek – East Creek Lake (r)
Green Creek - Green Creek Mosquito Imp. (Whitesboro) (r)
West Creek - Rt. 47- (Eldora) (c)
West Creek - Pickel Factory Pond Dam (Eldora) (r)

Delaware Bay (Cumberland Co.) Drainage

Shad River herring
Cedar Creek - Cedar Lake Dam (Cedarville) (c)
Dividing Creek - Mill Creek (Dividing Creek) (r)
Dividing Creek - Cub Swamp Creek (Dividing Creek) (r)
Nantuxtent River - Shaws Millpond Dam (Newport) (r)
Nantuxtent River - Middle Pond Dam (Newport) (r)

Delaware and Raritan Canal (Mainstem and Feeder)

No confirmed / reported spawning migrations

Delaware River (Mainstem) Drainage

Shad River herring
Delaware River – Entire length (c) (c)

Delaware River (Burlington Co.) Drainage

Shad River herring
Blacks Creek – Rt. 301 (Bordentown) (c)
Blacks Creek – NJ Rt. 130 culvert (Bordentown) (c)
Crafts Creek - Crafts Creek Dam (Roebling) (r)
Pompeston Creek – Pompeston Creek (Cinnaminson) (r)
Unnamed Tributary – Crystal Lake Dam (Bordentown) (r)

Delaware River (Camden Co.) Drainage

Shad River herring
Newton Creek – Newton Lake Dam (Oaklyn) (**Fish Ladder *)** (r)

Delaware River (Gloucester Co.) Drainage

Shad River herring
Repaupo Creek- Floodgate Repaupo Creek (Greenwich) (r)
Woodbury Creek – Stewart Lake Dam (Woodbury) (r)
(Fish Ladder *)

Delaware River (Hunterdon Co.) Drainage

Shad River herring
Fiddlers Creek – Rt. 29 (Titusville) (c)
Lockatong Creek – Rt. 29 (Kingwood) (c)
Delaware River – Lambertville Wing Dam (c)
Alexauken Creek – Alexauken Creek (Lambertville) (r)

Delaware River (Mercer Co.) Drainage

Shad River herring
Jacobs Creek – Rt. 29 (Sommerset) (c)
Steel Run – Washington Crossing St. Park (c)
(Washington Crossing)

Delaware River (Sussex Co.) Drainage

No confirmed / reported spawning migrations in tributaries to the Delaware River

Delaware River (Warren Co.) Drainage

No confirmed / reported spawning migrations in tributaries to the Delaware River (?)

Elizabeth River Drainage

No confirmed / reported spawning migrations

Flat Brook Drainage

No confirmed / reported spawning migrations

Forked River Drainage

Shad River herring
N. Branch Forked River – Lower Lake Dam (r)
(Forked River Beach)
Forked River – Middle Branch (c)

Great Egg Harbor River Drainage

Shad River herring
Patcong Creek – Bargaintown Lk. Dam **(fish ladder*)** (c)
(Somers Point) English Creek – Hogans Pond Dam (English Creek) (c)
Gibson Creek – Corbin City Imp. #1 (Gibson Landing) (c)
Peters Run – Corbin City Imp. #3 (Tuckahoe) (r)
Middle River – (Tuckahoe) (c)
Charley Creek – Corbin City Impoundment #3 (Tuckahoe) (c)
Hawkins Creek – Corbin City Imp. #2 (Estell Manor) (c)
Jacksons Creek – unnamed pond dam (Estell Manor) (c)
Stephan Creek – Stephans Lake Dam (Estellville) (c)
Miry Run – Rt. 559 (Estellville) (c)
South River – 11th Ave. (Harding Lakes) (c)
South River – Forty Wire Rd. (Harding Lakes) (c)
Gravelly Run – Rt. 559 (Clarks Run) (c)
Watering Race Branch – Babcock Creek (Mays Landing) (c)
Great Egg Harbor River – Lk. Lenape Dam **(fish ladder**)** (c)
(Mays Landing)

Hackensack River Drainage

Shad River herring
Hackensack River – Oradell Reservoir Dam (Jersey City) (c) (c)

Hudson River Drainage

Hudson River – Entire Length in New Jersey (c) (c)

Little Egg Harbor (Manahawkin Bay) Drainage

Shad River herring
Mill Creek – Manahawkin Lake Dam (Manahawkin) (c)
Tuckerton Creek – Pohatcong Lake Dam (Tuckerton) (c) Willis Creek- Willis Creek Dam (Giffordtown) (c)
Willis Creek – Radio Road (Giffordtown) (c)

Manasquan River Drainage

Shad River herring
Watson Creek – Stockton Lake Dam (Manasquan) (c)
Mill Run – Allaire State Park (Squankum) (c)

Manasquan River – U.S.G.S. Gage Dam (Lower Squankum) (r)

Mantua Creek Drainage

Shad River herring
Mantua Creek – lower- (Mount Royal) (c) (c)
Mantua Creek – Wenonah Lake Dam (Wenonah) (r)

Maurice River Drainage

Shad River herring
Maurice River- lower- (Buckshutem) (c) (c)
Muskee Creek – Rt. 47 (Bricksboro) (c)
Manumuskin Creek – Cumberland Pond Dam (Millville) (r)
Buckshutem Creek – Laurel Lake Dam (Bucketshutem) (c)
Menantico Creek – Menantico Sand Ponds (Millville) (c)
Hankins Brook – Rt. 47 (Millville) (c)
White Marsh Run – Silver Lake Dam (Millville) (c)
Maurice River – Union Lake Dam **(fish ladder+)** (Millville) (c)
Muddy Run – Rainbow Lake Dam (Vineland) (r)
Maurice River – Westside Park Dam (Vineland) (r)

Mededeconk River Drainage

Shad River herring
Metedeconk River – Twilight Lake Dam (Bayhead) (c)
N. Branch Beaver Dam Creek – Rt. 88 (Point Pleasant) (c)
S. Branch Beaver Dam Creek – Benton Woods/Lenape Terrance (c)
N. Branch Metedeconk River – Parkway Pond Dam (c)
(Laurelton Gardens)
S. Br. Metedeconk River –Shenandoah Lk. **(fish ladder+)** (c)
(Lakewood)
S. Br. Metedeconk River – Lake Carasaljo Lk. Dam **(fish ladder*)** (c)
(Lakewood)

Morses Creek Drainage

No confirmed / reported spawning migrations

Mullica River Drainage

Shad River herring
Ballanger Creek – Pollys Ditch (Mystic Island) (c)
Nacote Creek – Mill Pond Dam (Port Republic) (c)
Bass River- Bass River State Forrest (New Gretna) (c)
Jobs Creek – Rt. 9 (New Gretna) (c)
Negro Creek – Rt. 563 (Weekstown) (c)
Wading River – Rt. 542 (Wading River) (c)
Oswego River – Harrisville Lake Dam (Harrisville) (r)
Batsto River – Batsto Lake Dam **(fish ladder**)** (Batsto) (c)
Nescohague Creek – Above old dam site (Pleasant Mills) (c)
Hammonton Creek – Nescohague Lake Dam (c)

(Pleasant Mills)
Mullica River – Constable Bridge (Batsto) (c)

Musconetcong River Drainage

No confirmed / reported spawning migrations

Navesink River Drainage

Shad River herring
Navesink River - lower- (Redbank) (c)
Swamp Brook – Shadow Lake Dam (Middletown) (c)
Pine Brook – Swimming River- Riverdale Ave. (Clarkstown) (c)
Swimming River – Swimming River Reservoir Dam (Lincroft) (c)

Newark Bay (Essex, Hudson, & Union Counties) Drainage

Shad River herring
Newark Bay –Entire bay (Newark) (c) (c)

Oldmans Creek Drainage

Shad River herring
Beaver Creek – (Kay Gardens) (c)
Richmonds Branch – Porches Mill Dam (Porches Mill) (c)
Oldmans Creek – Harrisonville Lake Dam (Harrisonville) (r)

Oyster Creek Drainage

Shad River herring
Oyster Creek – Fire Pond Dam (Forked River) (c)

Passaic River Drainage

Shad River herring
Passaic River (lower) (Rutherford) (c) (c)
Third River – Kings Land Lake Dam (Nutley) (c)
Passaic River – Dundee Dam (Garfield) (c)

Paulins Kill Drainage

Shad River herring
Paulinskill River – Columbia Lake Dam (Columbia) (r) (r)

Pennsauken Creek Drainage

Shad River herring
Pennsauken Creek (lower) (Palmyra) (c)
Pennsauken Creek – Strawbridge Lake Dam (Moorestown) (r)

Pequest River Drainage

No confirmed / reported spawning migrations

Pochuck Creek Drainage

No confirmed / reported spawning migrations

Pohatcong Creek Drainage

No confirmed / reported spawning migrations

Raccoon Creek Drainage

Shad River herring
Raccoon Creek - lower- (Richwood) (c) (c)
Raccoon Creek – Swedesboro (Swedesboro) (c)
Unnamed tributary – Narraticon Lake Dam (Swedesboro) (r)
Unnamed tributary – Basgalore Lake Dam (Swedesboro) (r)
Raccoon Creek – Mullica Hill Pond (Mullica Hill) (r)
S. Branch Raccoon Creek – Hill Street (Harrison) (c)

Rahway River Drainage

No confirmed / reported spawning migrations upstream of estuarine waters

Rancocas Creek Drainage

Shad River herring
Rancocas Creek - lower - (Willingboro) (c) (c)
North Branch Rancocas Creek - Mill Dam (Mt. Holly) (r) (c)
SW Br. Rancocas Creek – Cotoxen Lake (Hainesport) (r)
S. Br. Rancocas Creek – (Rancocas Woods) (c)
S. Br. Rancocas Creek - Vincentown Mill Dam (Vincentown) (r)

Raritan Bay Drainage

Shad River herring
Comptons Creek – Broadway Ave. (Belford) (c)
Cheesequake Creek– Hooks Creek Dam (Cheesequake) (c)

Raritan River Drainage

Shad River herring
Raritan River – Calco Dam **(notched+)** (Bridgewater) (c) (c)
Raritan River – Island Farm Weir **(fish ladder+)** (c) (c)
(Bridgewater)
Raritan River – Manville Dam (Manville) (c)
Raritan River – Nevius Street (Raritan) (r) (r)
Raritan River – Roberts Street Dam (Bridgewater) (r)
Royces Brook – Raceway **(fish ladder*)** (Manville) (c)
South River - Duhernal Lake Dam (Old Bridge) (c) (c)
Millstone River – Weston Causeway Dam (Manville) (c) (c)
Raritan River – Lower Duke Island Dam (Raritan) (r)
Lawrence Brook – Weston Mill Pond Dam (South River) (c)

Salem River Drainage

Shad River herring

Mannington Creek – Floodgates (Welchville) (r)
Mannington Creek - Rt. 540 (Welchville) (c)
Salem River – Salem Canal Floodgates (Salem) (r)
Fenwick Creek – Floodgates (Salem) (r)

Shark River Drainage

Shad River herring
Shark River – Remsen Mill Dam (Neptune City) (r)

Shrewsbury River Drainage

No confirmed / reported spawning migrations upstream of estuarine waters

Stow Creek Drainage

Shad River herring
Raccoon Ditch – Davis Millpond Dam (Greenwich) (c)
Canton Drain – Floodgate (Canton) (r)
Stow Creek – Lakespur Lake Dam (Stow Creek) (r)
Stow Creek – Buckhorn Road (Stow Creek) (c)
Stow Creek – Denn Branch (Stow Creek) (c)
Stow Creek – Jericho Pond (c)

Toms River Drainage

Shad River herring
Mill Creek – Pine Beach (Pine Beach) (c)
Wrangle Brook – Gem Street (Silver Ridge Park) (c)
Toms River – Rt. 9 (Toms River) (c)
Jakes Branch – Flint Road (Toms River South) (c)
Jeffreys Creek – Lily Pond Dam (Toms River) (c)
Davenport Branch – Silver Ridge Park (Silver Ridge Park) (c)
Long Swamp Creek – Washington Ave (Toms River) (c)

Tuckahoe River Drainage

Shad River herring
Cedar Swamp Creek – Rt. 50 (Petersburg) (c)
Halfway Creek – Tuckahoe Imp. #1 (Petersburg) (c)
Bog Branch – Tuckahoe Imp. #2 (Tuckahoe) (c)
Flat Creek – Tuckahoe Imp. #3 (Middletown) (c)
Back Run – Unnamed Pond Dam (Tuckahoe) (c)
Warner Mill Stream – Aetna Rd. (Head of River) (c)
McNeals Branch – Aetna Rd.(Belleplain) (c)
Tuckahoe River – Peaslee Tract (Tuckahoe) (c)
Tuckahoe River – U.S.G.S. Gage Dam (Head of River) (c)

Wallkill River Drainage

No confirmed / reported spawning migrations

Wreck Pond Creek Drainage

Shad River herring
Wreck Pond Creek – Old Mill Pond Dam (c)
(Spring Lake Heights)

References

Zich, H.E. 1978. “Information on Anadromous Clupeid Spawning In New Jersey”, Department of Environmental Protection, Division of Fish and Wildlife. Miscellaneous Report No. 41. 28p.

Appendix 2

LIST OF THREATENED AND ENDANGERED SPECIES THAT ARE CRITICALLY DEPENDENT ON REGULATED WATERS FOR SURVIVAL

Revised May 15, 2008

In order for the Department to determine compliance with the Flood Hazard Area Control Act rules at N.J.A.C. 7:13, each application for a flood hazard area verification, individual permit or general permit (except general permits 2F, 2G and 4) must include an analysis of the project's status with regard to the Department's "Landscape Project" mapping, as well as a "natural heritage data request" letter from the Department's Natural Heritage Program. The Landscape Project mapping and Natural Heritage Program data request shall, at a minimum, identify all threatened and endangered species on site, as well as all threatened and endangered species that are "critically dependent on the regulated water for survival" which occur within one mile of the site. An application will not be considered complete unless it contains these two documents. he Department has determined that the following threatened or endangered species are critically dependent on the regulated water to survive. These species are as follows:

REPTILES

NAME	COMMON NAME
Endangered	
Crotalus h. horridus*	Timber rattlesnake
Glyptemys muhlenburgii	Bog turtle
Regina septemvittata	Queen snake
Threatened	
Clemmys insculpta	Wood turtle

* Locations in coastal plain only

AMPHIBIANS

NAME	COMMON NAME
Endangered	
Ambystoma laterale	Blue-spotted salamander
Threatened	
Eurycea longicauda	Long-tailed salamander

INVERTEBRATES

NAME	COMMON NAME
Endangered	
Alasmidonta heterodon	Dwarf wedgemussel (mussel)
Alasmidonta varicose	Brook floater (mussel)
Lasmigona subviridis	Green floater (mussel)

Threatened	
Alasmidonta undulate	Triangle floater (mussel)
Lampsilis cariosa	Yellow lampmussel (mussel)
Lampsilis radiata	Eastern lampmussel (mussel)
Leptodea ochracea	Tidewater mucket (mussel)
Ligumia nasuta	Eastern pondmussel (mussel)

PLANTS

NAME	COMMON NAME
Aeschynomene virginica	Sensitive Joint-vetch
Alisma triviale	Large Water-plantain
Ammannia latifolia	Koehn's Toothcup
Andromeda glaucophylla	Bog Rosemary
Arceuthobium pusillum	Dwarf Mistletoe
Armoracia lacustris	Lake Water-cress
Asimina triloba	Pawpaw
Aster borealis	Rush Aster
Aster firmus	Shining Aster
Aster radula	Low Rough Aster
Athyrium pycnocarpon	Glade Fern
Atriplex subspicata	Saline Orache
Bidens beckii	Water-marigold
Bidens eatonii	Eaton's Beggar-ticks
Boltonia asteroides var. glastifolia	Southern Boltonia
Cacalia atriplicifolia	Pale Indian Plantain
Calamagrostis pickeringii	Pickering's Reed Grass
Calystegia sepium ssp. erratica	Occluded Bindweed
Cardamine longii	Long's Bittercress
Cardamine maxima	Large Toothwort
Cardamine rotundifolia	Round-leaf Bittercress
Carex alopecoidea	Foxtail Sedge
Carex aquatilis	Water Sedge
Carex brunnescens	Round-spike Brownish Sedge
Carex bushii	Bush's Sedge
Carex crawei	Crawe's Sedge
Carex cumulata	Clustered Sedge
Carex formosa	Handsome Sedge
Carex haydenii	Cloud Sedge
Carex jamesii	James' Sedge
Carex joorii	Cypress-swamp Sedge
Carex limosa	Mud Sedge
Carex louisianica	Louisiana Sedge
Carex lupuliformis	Hop-like Sedge
Carex pseudocyperus	Cyperus-like Sedge
Carex tuckermanii	Tuckerman's Sedge
Ceratophyllum echinatum	Spiny Coontail
Chenopodium rubrum	Red Goosefoot
Cinna latifolia	Slender Wood-reed
Cirsium virginianum	Virginia Thistle
Claytonia virginica var. hammondiae	Hammond's Yellow Spring Beauty

Cleistes divaricata	Spreading Pogonia
Coelorachis rugosa	Wrinkled Jointgrass
Conioselinum chinense	Hemlock-parsley
Cornus amomum var. schuetzeana	Pale Dogwood
Cryptogramma stelleri	Slender Rockbrake
Cuscuta cephalanthi	Buttonbush Dodder
Cuscuta indecora	Collared Dodder
Cyperus lancastriensis	Lancaster Flat Sedge
Cyperus polystachyos	Coast Flat Sedge
Cyperus pseudovegetus	Marsh Flat Sedge
Cyperus refractus	Reflexed Flat Sedge
Cyperus tenuifolius	Low Spike Sedge
Cypripedium candidum	Small White Lady's-slipper
Cypripedium reginae	Showy Lady's-slipper
Dalibarda repens	Robin-run-away
Dicentra canadensis	Squirrel-corn
Diodia virginiana	Larger Buttonweed
Eleocharis brittonii	Britton's Spike-rush
Eleocharis compressa	Flat-stem Spike-rush
Eleocharis equisetoides	Knotted Spike-rush
Eleocharis melanocarpa	Black-fruit Spike-rush
Eleocharis minima	Small Spike-rush
Eleocharis pauciflora	Few-flower Spike-rush
Eleocharis tenuis var. verrucosa	Warty Spike-rush
Eleocharis tortilis	Twisted Spike-rush
Ellisia nyctelea	Aunt Lucy
Elymus trachycaulus	Slender Wheatgrass
Equisetum pratense	Meadow Horsetail
Equisetum variegatum	Variegated Horsetail
Eriophorum gracile	Slender Cotton-grass
Eriophorum tenellum	Rough Cotton-grass
Eriophorum vaginatum var. spissum	Sheathed Cotton-grass
Eupatorium capillifolium	Dog-fennel Thoroughwort
Eupatorium resinosum	Pine Barren Boneset
Euphorbia purpurea	Darlington's Glade Spurge
Filipendula rubra	Queen-of-the-prairie
Fraxinus profunda	Pumpkin Ash
Galium labradoricum	Labrador Marsh Bedstraw
Galium trifidum	Small Bedstraw
Gaultheria hispidula	Creeping-snowberry
Gentiana linearis	Narrow-leaf Gentian
Glaux maritima	Sea-milkwort
Glyceria borealis	Small Floating Manna Grass
Glyceria grandis	American Manna Grass
Helonias bullata	Swamp-pink
Hemicarpha micrantha	Small-flower Halfchaff Sedge
Hottonia inflata	Featherfoil
Hydrocotyle ranunculoides	Floating Marsh-pennywort
Hydrophyllum canadense	Broad-leaf Waterleaf

Hypericum adpressum	Barton's St. John's-wort
Hypericum majus	Larger Canadian St. John's Wort
Hypericum prolificum	Shrubby St. John's-wort
Ilex montana	Large-leaf Holly
Isoetes lacustris	Lake Quillwort
Isoetes melanopoda	Black-base Quillwort
Isoetes tuckermanii	Tuckerman's Quillwort
Juncus brachycarpus	Short-fruit Rush
Juncus caesariensis	New Jersey Rush
Juncus coriaceus	Awl-leaf Rush
Juncus elliottii	Elliott's Rush
Juncus torreyi	Torrey's Rush
Kalmia polifolia	Pale-laurel
Lemna perpusilla	Minute Duckweed
Lemna valdiviana	Pale Duckweed
Limosella subulata	Awl-leaf Mudwort
Linnaea borealis	Twinflower
Linum intercursum	Sandplain Flax
Listera cordata	Heartleaf Twayblade
Listera smallii	Appalachian Twayblade
Lobelia boykinii	Boykin's Lobelia
Lobelia dortmanna	Water Lobelia
Lonicera canadensis	American Fly-honeysuckle
Luzula acuminata	Hairy Wood-rush
Lycopodium annotinum	Stiff Club-moss
Malaxis monophyllos	White Adder's-mouth
Melanthium virginicum	Virginia Bunchflower
Micranthemum micranthemoides	Nuttall's Mudwort
Milium effusum	Tall Millet Grass
Monarda clinopodia	Basil Beebalm
Myriophyllum pinnatum	Cutleaf Water-milfoil
Myriophyllum sibiricum	Common Water-milfoil
Myriophyllum tenellum	Slender Water-milfoil
Myriophyllum verticillatum	Whorled Water-milfoil
Narthecium americanum	Bog Asphodel
Nelumbo lutea	American Lotus
Nuphar microphyllum	Small Yellow Pond-lily
Ophioglossum vulgatum var. pycnostichum	Southern Adder's-tongue
Panicum boreale	Northern Panic Grass
Panicum flexile	Wiry Panic Grass
Panicum hirstii	Hirst Brothers' Panic Grass
Penstemon laevigatus	Smooth Beardtongue
Phlox divaricata	Wild Blue Phlox
Phlox pilosa	Downy Phlox
Phyla lanceolata	Fogfruit
Picea rubens	Red Spruce
Platanthera flava var. flava	Southern Rein Orchid
Platanthera integra	Yellow Fringeless Orchid
Platanthera nivea	Snowy Orchid

Platanthera peramoena	Purple Fringeless Orchid
Pluchea foetida	Stinking Fleabane
Polemonium reptans	Greek-valerian
Polygonum densiflorum	Dense-flower Knotweed
Potamogeton alpinus	Northern Pondweed
Potamogeton illinoensis	Illinois Pondweed
Potamogeton obtusifolius	Blunt-leaf Pondweed
Potamogeton praelongus	White-stem Pondweed
Potamogeton robbinsii	Robbin's Pondweed
Potamogeton zosteriformis	Eel-grass Pondweed
Potentilla palustris	Marsh Cinquefoil
Prenanthes racemosa	Smooth Rattlesnake-root
Ptelea trifoliata	Wafer-ash
Quercus lyrata	Overcup Oak
Quercus nigra	Water Oak
Ranunculus cymbalaria	Seaside Buttercup
Ranunculus reptans	Creeping Spearwort
Rhexia aristosa	Awned Meadow-beauty
Rhexia interior	Showy Meadow-beauty
Rhododendron canadense	Rhodora
Rhynchospora capillacea	Capillary Beaked-rush
Rhynchospora filifolia	Thread-leaf Beaked-rush
Rhynchospora globularis	Coarse Grass-like Beaked-rush
Rhynchospora glomerata	Clustered Beaked-rush
Rhynchospora knieskernii	Knieskern's Beaked-rush
Rhynchospora microcephala	Small-head Beaked-rush
Rhynchospora rariflora	Rare-flower Beaked-rush
Ribes missouriense	Missouri Gooseberry
Rubus canadensis	Smooth Blackberry
Rudbeckia fulgida	Orange Coneflower
Ruellia caroliniensis	Carolina Petunia
Sacciolepis striata	American Cupscale
Sagittaria australis	Southern Arrowhead
Sagittaria cuneata	Arum-leaf Arrowhead
Sagittaria teres	Slender Arrowhead
Salix pedicellaris	Bog Willow
Scheuchzeria palustris	Arrow-grass
Schoenoplectus torreyi	Torrey's Bulrush
Schwalbea americana	Chaffseed
Scirpus longii	Long's Woolgrass
Scirpus maritimus	Saltmarsh Bulrush
Scirpus microcarpus	Barberpole Bulrush
Scirpus pedicellatus	Stalked Woolgrass
Scleria verticillata	Whorled Nut-rush
Silene nivea	Snowy Catchfly
Sisyrinchium montanum	Strict Blue-eyed Grass
Smilacina trifolia	Three-leaf False Solomon's-seal
Solidago rigida	Prairie Goldenrod
Sparganium angustifolium	Narrow-leaf Burr-reed

Sparganium minimum	Small Burr-reed
Sphagnum angustifolium	Sphagnum
Sphagnum austinii	Sphagnum
Sphagnum centrale	Sphagnum
Sphagnum contortum	Sphagnum
Sphagnum macrophyllum var. floridanum	Sphagnum
Sphagnum majus ssp. norvegicum	Sphagnum
Sphagnum platyphyllum	Sphagnum
Sphagnum quinquefarium	Sphagnum
Sphagnum riparium	Sphagnum
Sphagnum strictum	Sphagnum
Sphagnum subfulvum	Sphagnum
Sphagnum subsecundum	Sphagnum
Spiranthes laciniata	Lace-lip Ladies'-tresses
Sporobolus neglectus	Small Rush-grass
Stachys palustris var. homotricha	Hairy Hedge-nettle
Stellaria borealis	Boreal Starwort
Stellaria pubera	Star Chickweed
Streptopus amplexifolius	White Twisted-stalk
Streptopus roseus	Rosy Twisted-stalk
Suaeda rolandii	Roland's Seablite
Thuja occidentalis	Arborvitae
Tiarella cordifolia	Foamflower
Tofieldia racemosa	False Asphodel
Triadenum walteri	Walter's St. John's-wort
Trichomanes intricatum	Weft Fern
Triglochin maritima	Seaside Arrow-grass
Trollius laxus ssp. laxus	Spreading Globe Flower
Utricularia biflora	Two-flower Bladderwort
Utricularia minor	Lesser Bladderwort
Utricularia olivacea	Dwarf White Bladderwort
Utricularia resupinata	Reversed Bladderwort
Uvularia puberula var. nitida	Pine Barren Bellwort
Valerianella umbilicata	Navel Cornsalad
Veronica catenata	Sessile Water-speedwell
Viburnum alnifolium	Witch-hobble
Viola septentrionalis	Northern Blue Violet
Vitis novae-angliae	New England Grape
Wolffiella floridana	Sword Bogmat
Xyris caroliniana	Sand Yellow-eyed-grass
Xyris fimbriata	Fringed Yellow-eyed-grass
Xyris montana	Northern Yellow-eyed-grass
Zigadenus leimanthoides	Death-camus